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<i>The Flintstones</i> – a live-action ode to the cartoon series – was a light-hearted romp through Bedrock. Underlying its sight gags, however, was a serious filmmaking effort that required animatronic puppets from Jim Henson's Creature Shop, large-scale physical effects by Michael Lanteri, as well as computer graphics and complex image processing by Industrial Light & Magic. <i>Article by Jody Duncan.</i>	
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Filmmakers Joel and Ethan Coen are not typically associated with visual effects extravaganzas. But with <i>The Hudsucker Proxy</i> , they jumped headlong into extensive miniature sets, digital compositing and outrageous mechanical rigs. Joining the fray were Micheal J. McAlister, Stetson Visual Services, Peter Chesney, Mark Sullivan and Computer Film Company. <i>Article by W.C. Odien.</i>	
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COVER – Dino awaits his master's homecoming in *The Flintstones*.
(Photograph by Ron Batzdorff.)

QUICK CUTS

CRIME AND BANISHMENT

article by Jody Duncan

No Escape – directed by Martin Campbell and produced by Gale Anne Hurd – takes place in 2022 on the remote island of Absolom where incorrigibly violent criminals are banished for life. Dropped onto the island is Marine Captain John Robbins (Ray Liotta), a man as hostile and isolated as the island itself. Haunted by memories of a military action in which hundreds of innocent people were slaughtered, Robbins has since been convicted of murdering the commanding officer responsible. After escaping more than one prison, the highly-skilled soldier is transported to the Leviticus Maximum Security facility where an attack on the warden leads to his disposal on Absolom.

Because most of the film's action was to take place on the rugged island – represented by a location at Lake Tinaroo, Australia – the futuristic setting had to be established in a mere handful of shots. It was for these that Hurd enlisted visual effects supervisor Robert Skotak, visual effects executive producer Elaine Edford and visual effects director of photography Dennis Skotak. From early discussions with Hurd and Campbell, Robert Skotak surmised that the visual effects contribution to *No Escape* would be limited to only a dozen shots.

The first of the film's effects shots is in the opening sequence in which Robbins is transported by train to Leviticus. As the condemned man peers out the window, a bleak desert terrain is revealed. "We erected a window and created a moving landscape behind it using a four-by-eight-foot painting of distant rocks and a horizon," Skotak explained. "We mounted the painting and some foreground rocks on tracks that moved at different speeds: very fast near the window, then slower as we got farther away. We also put reflections in the glass to clarify the fact that we are looking through a window."

The opening also included wider views of the train traveling through the desert. In one shot, the train moved right to left in the distance, exited frame, then rushed by in the foreground, left to right. Two differently-scaled models built by Jim Towler were used to achieve the shot. A seven-inch-long train – about sixtieth-scale – was put on a four-by-ten-foot desert miniature and filmed passing through the background and exiting frame. A larger fifteenth-scale model was then timed to appear in the foreground. Both train models were motorized by mechanical rigger Joel Steiner.

The desert was a relatively simple blend of joint compound, foil and red powdered paint. “We found that powder paints worked well for creating a red dust effect. The set was low-relief and done in perspective. It was sloped downward, toward camera, with little ridges in the desert floor that were a quarter-inch high near the train track and three or four inches high nearer the camera.”

Also in the opening was an establishing view of Leviticus. A two-and-a-half-foot tall, 1/240th-scale model of the prison was built by Faisal Karim from sketches provided by production designer Allan Cameron. While the extremely small-scaled prison model worked nicely for the wide shot of the facility, Skotak determined that a similarly-scaled train would not suffice for the subsequent shot of the train’s arrival at the prison. To avoid additional model building, the seven-inch train employed previously was set on a track off to the right side of the camera, while a mirror was positioned in front of camera to reflect the train – now appropriately scaled due to its distance from camera – in front of the Leviticus model.

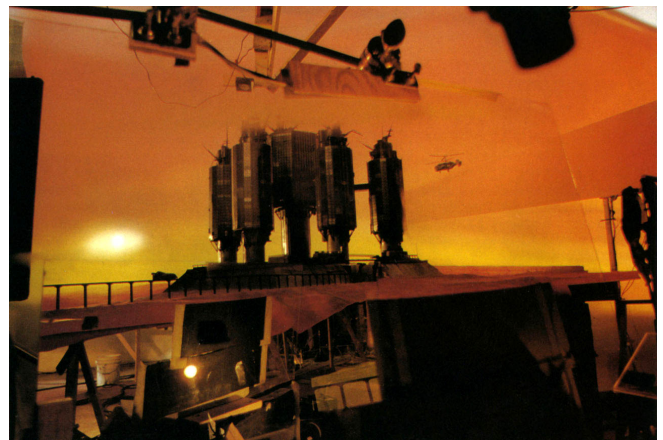
Another element of the shot was a helicopter hovering over the prison. Built by Joel Steiner, the helicopter model – approximately forty-eighth-scale – was mounted on a pylon hidden by a piece of foamcore. “To correct the differential in scales between the helicopter and the prison, we put the helicopter three feet behind the Leviticus model, but made it look as if it was hovering directly in front of it. To conceal the foamcore, we relied on lighting. The reddish sky behind the prison was all done with gelled lights on white paper; so we just had to light the foamcore to match.”

Helicopters further back were realized more simply. “Since we were creating the sky coloration with lights, we got by with just attaching photographs of two helicopters on the backing which was on a motorized track that moved both it and the attached helicopters slowly left to right. We had another helicopter in the sky that was the same scale as the Leviticus model – only about an inch long. That was on a pylon, with a card in front that was painted to match the background. This helicopter model was so small there was no motorizing it, so we put a pinwheel above it with a little air line blowing on it to give it a choppy motion.”

Although the director was pleased with the completed establishing shot, Skotak, on his own, opted to tweak it using digital tools. Digital compositing had become something of a necessity when twenty shots were added to the workload.



A train arrival at the futuristic Leviticus prison station was among the miniature effects produced by 4-Ward Productions for No Escape.



A complex establishing shot of the prison was achieved largely in-camera at 4-Ward, with digital sweetening by Praxis Film Works.

“We had to find a quicker means of doing some of the more complex shots, as opposed to doing them as time-consuming in-camera shots. So we made a deal with Praxis Film Works which had just set up a Domino system. Domino is similar to a Harry or a Henry, except it has close to film resolution.” With the Domino system at his disposal, Skotak was able to finesse the Leviticus establishing shot to his satisfaction. “We worked with T.J. Morgan and Blondel Aidoo at Praxis. I had them airbrush the horizon and massage the blend on the foamcore, punch up the sun a little hotter, and so on.”

A later shot reveals the train pulling into the prison station – a fifteenth-scale miniature built by Jim Towler. “It was one of those huge vaulted ‘science fiction’ chambers of the future. There was a motorized pull that opened the doors and pulled the train in. Jim also sculpted some manually operated puppets to act as guards in the model set. I made another figure that was an articulated photo cutout with a separate, movable gun and a sculpted visor. We also shot Jim Towler in a guard uniform bluescreen and composited those elements in with the Domino.”

In addition to the opening shots, the effects team was responsible for creating a series of fiery effects that serve to reveal Robbins’ horrific memories. Skotak’s team shot pyro elements which were optically composited by Perpetual Motion Pictures. “The first time we see the effect, it’s an abstract image of fire rushing at the camera and then rushing away. For that, we shot a propane mortar right at camera; then we fired another one back over the ‘shoulder’ of the camera and did an optical dissolve between the two. To make it more surrealistic, we took half the image, flopped it then did a soft blend between the two halves. It made the shot more symmetrical and stylized. The second image, which was more of a dreamlike inferno, was realized by shooting naphthalene explosions upward at the camera, then letting them go out of focus to get a hazy kind of look.”

In later flashbacks, shadowy shapes are discernible in the inferno. “For the third sequence, in which you begin to see people, we shot puppets in water. Jim Towler made three floppy marionettes – a child, a man and a woman – which were operated by monofilament. We set up a water tank and shot these figures silhouetted against white foamcore. By stirring the water, we could get a lot of free animation and naturalistic motion.” The resulting images were combined, repositioned, sized and composited as high-contrast elements thrown out of focus against a wall of fire and explosions.

By production’s end, the visual effects team had contributed shots of the prison hall – complete with hologram projection of the warden – the stealth boat engineered as a means of escape, and missiles firing from airborne helicopters. In fact, the ‘non-effects movie’ eventually required some thirty visual effects shots.

Characterized by rugged terrains, medieval-like sets and a primitive story of survival, *No Escape* was an atypical science fiction offering – and a most unusual effects assignment. “I thought of the movie as a salute to the David Lean films – *Lawrence of Arabia* or *Bridge on the River Kwai* – because it melds big imagery with an intimate story. And I think the movie has a different tone because the producers weren’t overly concerned – as Hollywood usually is – with rushing the story along just to get to the action. This story builds at its own pace. We wait for movies like that to come along. For us, *No Escape* was especially exciting since it allowed us to further explore our hybrid of in-camera compositing and digital technology.”

QUICK CUTS VISIONARY VISUALS

article by Dale Kutzera

The art of special effects is making the unreal believable. But for the makers of *Blink*, the challenge was to make reality unbelievable. Regaining her sight through a cornea transplant after twenty-five years of blindness, Emma (Madeleine Stowe) sees the world as a blurred, watery muddle. She can barely identify her own reflection, let alone the face of a man she witnesses committing murder.

Director Michael APTED and visual effects supervisor Art Durinski depended on a range of techniques to create Emma's distorted vision, from straightforward in-camera trickery to the high-tech computer wizardry of MetroLight Studios, the six-year-old digital effects house that has generated eye-catching effects for film, television, commercials and theme park rides.

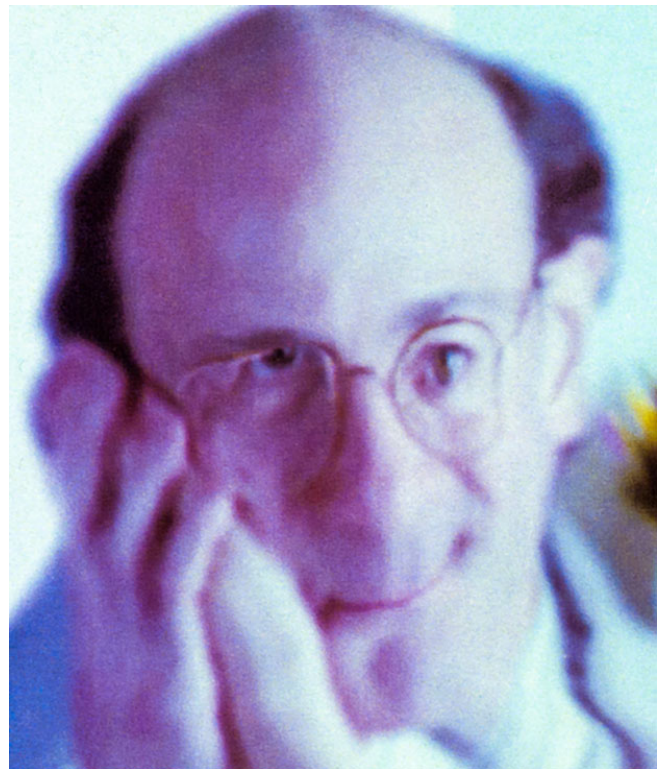
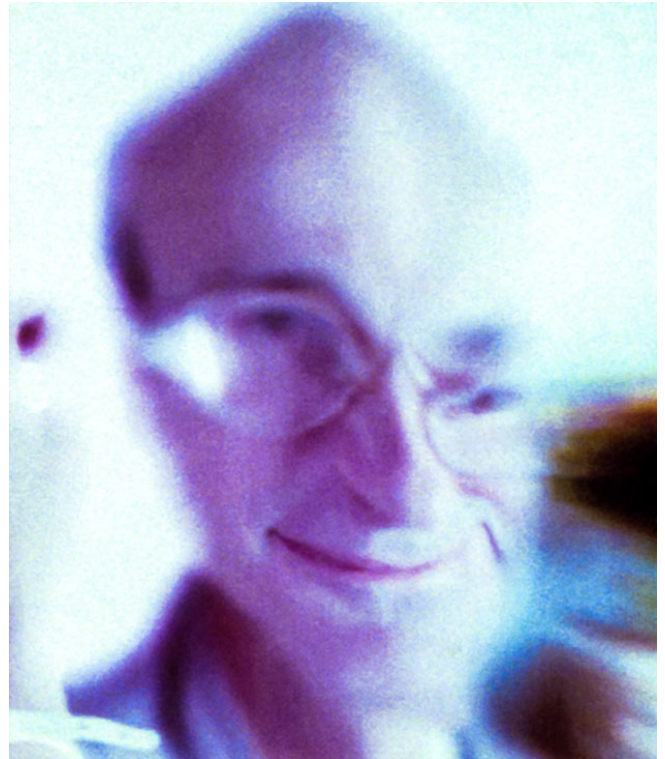
Blink presented several challenges, the first being to develop a look for the 'Emmavision' effect that would be featured throughout the film. The premise for the effect – any for the film itself – was derived from an article by neurologist Oliver Sax. "In the article," explained Kerry Colonna, CGI director and designer at MetroLight, "Sax discussed how totally blind people who regain their sight are not necessarily gifted with this newfound perception. Seeing is a language like anything else, and they have to learn how to see. Often it is very traumatic, and frequently it makes people want to revert back to being blind. A certain percentage of these people will see something, but won't perceive it until much later in time – perhaps even days later – and then will frequently superimpose that image over what they are currently seeing."

The result is a blurred, warping view, rather like looking through a sheet of falling water. In fact, director of photography Dante Spinotti created some perspective shots for the film in-camera by moving two warped, distorted sheets of plexiglas directly in front of the lens. MetroLight took this concept into the digital realm by employing a complicated morphing and warping technique for three key sequences – Emma's view of her doctor when her bandages are first removed, her view as she inspects her features in a mirror, and her view of several murder suspects in a police lineup.

Even before MetroLight was brought onto the project, Apted and Durinski had conceived the idea of representing Emma's uncoordinated eyesight by morphing between two camera angles of the same actor shot against a bluescreen. "The first thing we did was a preliminary lining up of the two shots," said supervising technical director Jerry Weil. "We actually took points between the two eyes and matched them up so that we'd have focal points for the two images. Then there was the pre-warping stage where we'd do all kinds of stretching and scrunching to get the features pretty much lined up and the outline of the head in roughly the same place. Once we had that done, we did a very straightforward morphing process on the overall face, then pulled out individual features."

MetroLight's first attempt at the effect resulted in a look that was too carefully aligned, and thus less than extraordinary. Apted requested that the effect be made more Picasso-esque, with the images severely misaligned and verticals shifting. MetroLight complied, executing a post-morph effect that was laid on top of the combined blue-screen images. "When we had our first screening of the rough cut, our effects looked as if we were just shooting through water or mylar," said Weil. "To fix that, we misaligned things a little more and did this whole post-warping effect. We also lined up the features even closer to each other. Originally we had a rough line-up and that added to the watery effect – because when things aren't lined up exactly right, the look is not that solid – so I went back and very carefully lined things up, and put in more key frames and tried to make all the features very close and tight to each other."

"Beyond that, we slipped the timing of the footage," added Colonna. "Any individual feature was as much as twenty frames off, slipped ten forward and ten backwards. So if we were on frame one of one eye, we might be on frame twenty of the opposite eye. To keep track of all that during head movement, and not have the seams opening up between elements, was a really challenging technical task."



For Blink, MetroLight Studios digitally processed live-action plate photography to simulate the distorted vision of a woman whose sight has been restored after years of blindness.

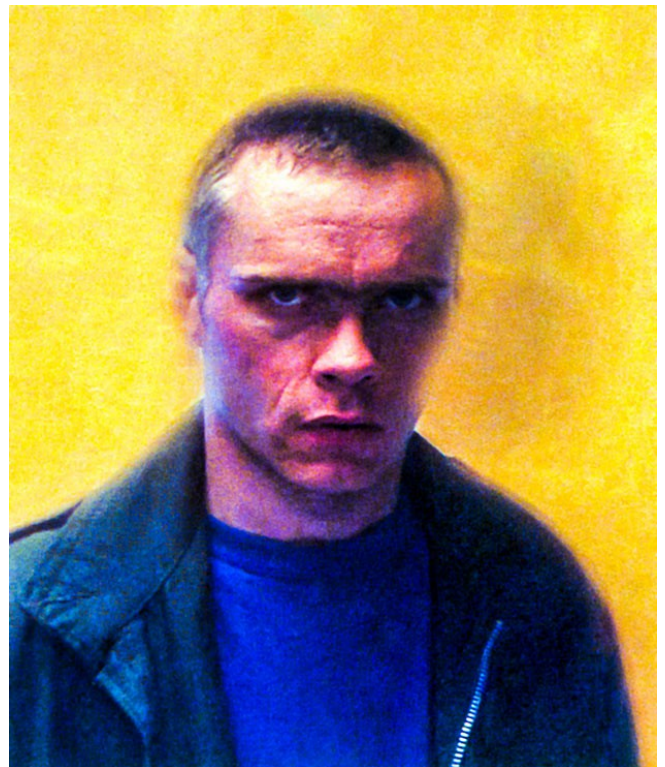
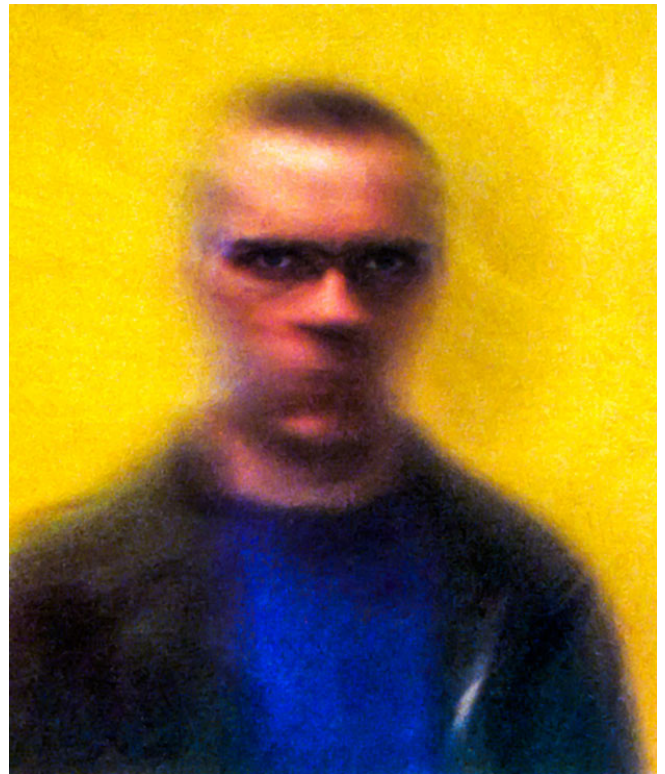
The animators took many of their cues from the actors' performances, For instance, in the first shot when Emma attempts to touch her doctor's face and misses, the animators simply warped the actor's head suddenly to one side. When she pats his cheek, they arranged a series of morphs from one side of his head to the other, giving the impression that his face is rippling from the impact. The more distorted version of the doctor was then composited over a background plate, and the entire scene was treated with an overall warping effect. "Everything blurred out in radial patterns," Weil explained. "We would animate the focal point slowly back and forth to make things look as if they were shifting – kind of a double-imaging effect. There were also some image processing effects against the blurring and the contrast."

Emma's distorted POV, which had been photographed to match the normal-appearing reverse angles, was then brightened to simulate her initial sensitivity to light. "At first it's like an atomic blast," explained Colonna. "The light is just too inundating, and she can't quite make out anything. Then, every time we cut back to her POV, the exposure comes down and the contrast is increased to a more normal range. Just toward the end of the shot you start to be able to recognize an image."

Finally, Weil added a subtle unfolding effect to the very beginning of the shot, as though the image were stretching out from the center to normal width. “It was basically a warping effect where I took the image and compressed it into a pinhole in the center, then animated outward so everything stretched out.”

With the look of Emmavision established, MetroLight used the same basic techniques for a scene in which Emma examines her own reflection. A more challenging sequence – demanding further experimentation – was the police lineup where Emma tries to identify a murderer, despite her distorted vision. The difficult task becomes virtually impossible when the features of each suspect disappear, leaving them faceless until the killer’s gaze penetrates her muddy vision with crystal clarity. “We used a wire removal software, modified slightly,” explained Weil. “Wire removal is a technique that is based on morphing. It takes the two pieces of the image on either side of the wire and morphs them together so they cover it up. We used that same technique on the faces by treating the eye, for instance, as a big wire and scrunching the skin around it together.”

The animators tracked the features of each subject as they turned one way or another, setting key frames every five or ten frames from which the computer would interpolate the effect. The process was used again in the next shot, which appears to be a medium tracking shot down the row of suspects. To further represent Emma’s confusion, Apted determined that, in this shot, all five suspects would be played by one actor. Thus, the shot was assembled digitally by compositing five separate elements of Paul Dillon – the actor playing the murderer – dressed to match each suspect in the master shot. It was left to MetroLight to combine these elements into one continuous pan. A rough composite was prepared using low-resolution video as a quick way to identify the takes Apted liked. “What we did was take that imagery and run an



Selective morphing techniques were employed to reveal a killer's facial features emerging from blurriness during a police lineup.

edge detection process on it to get a very simple black-and-white guide for each frame. We ran that directly into our choreography so we could match it very precisely.”

The distorted characters – originally filmed against a bluescreen – were then matted onto a background plate of the wall and given a subtle computer generated shadow. Once again, an overall warping effect was added to the completed image, further obscuring the view. With the various characters stacked side by side, the computer simply panned across the composite image, simulating a lengthy tracking shot.

The chilling punch to this scene comes when the face of the murderer emerges clearly – an effect achieved by simply relaxing the distortion around that character. What at first appears to be the killer then distorts to reform as another character. “The clients on this job were very clear about not wanting anything that looked like a straight morph,” said Weil, “so in this case, we did a straight morph, but covered it with a rippling effect. It all blended together as the same process.”

Blink demonstrates the potential to digitally alter such basic photographic elements as exposure, contrast, focus and movement. “I think computers are coming of an age where anything is possible,” speculated Colonna. “What needs to be explored more thoroughly is the creative use of that medium. The limitation a computer has now is the amount of footage it can produce in a finite period of time. It is still rather cumbersome to carry around high-resolution pictures. Once that becomes more facile, I think we will see entire films done on computer.”

QUICK CUTS

MAKING THE CROW FLY

article by Jody Duncan

Visual effects are commonly called upon to add razzle-dazzle to spaceship dogfights, to realize mythical creatures or to create fantastic worlds. But rarely have effects been relied upon to essentially resume a performance interrupted by the death of an actor. The circumventing of just such tragic circumstances was the assignment faced by the digital division of Dream Quest Images, however, when the production of *The Crow* came to a horrific halt with the accidental on-set death of its star, Brandon Lee.

Directed by Alex Proyas and based on the comic books by James O'Barr, *The Crow* tells the story of rock musician Eric Draven, who is slain and then rises from the grave to assume a new identity as the Crow and avenge his own murder. Dream Quest was already on the project, providing visual effects for the low-budget independent production, when – mere days before the film's completion – twenty-eight-year-old Lee was killed by a bullet fired from a prop gun. Shaken by the accident, the production team took a two-month hiatus to determine how and if the film could be completed.

Complicating the situation was the fact that the scenes that had not yet been filmed – flashbacks in which the main character recalls his violent death – were among the few in the movie that featured Lee's face sans the heavy Crow makeup. "They had very little footage of Brandon without this crazy makeup on," noted DQ head of digital imagery Howard Burdick. "But there were scenes they absolutely had to get – crucial story points they had to have on film in order to finish the movie. They knew they could do some things with stand-ins, but there were certain moments where they had to see Brandon's face."

The filmmakers' ultimate plan for completing the movie entailed a minor rewrite and reshooting of the opening – in which the main character's girlfriend would bear more of the expository burden – and a minimal employment of digital effects to finesse Brandon Lee into scenes he had never completed. The producers determined that seven digitally manipulated shots were all that would be required to finish the movie and leave the storyline intact. "The production company was fairly clever about how to get around the problem," visual effects supervisor Tim Landry recalled. "During that two months of regrouping, they went back and shot the elements we would need to put these things together. But even so, the elements we had to work with were not optimal."

Essentially, the seven shots broke down into three different types: those that required rotoscoping Lee out of one scene and inserting him into another; those that entailed grafting his face digitally onto a body double's; and those that required taking footage of Lee and using it for scenes other than the ones originally intended – an approach that necessitated color corrections and digital manipulations of the original photography.

The first of the digitally altered shots appears early in the film, when the Crow returns to the apartment where his murder took place. "While he is there, he has all these flashbacks of his death," said Burdick. "They had shot Brandon walking through an alleyway and through these old abandoned buildings, but they didn't have any shots of him inside the apartment. So our job was to

roto Brandon out of some of these exterior shots and put him into an interior shot of the apartment.” The original photography of Lee in the alleyway was far from ideal. “They had photographed him on location, in the rain, and with a hand-held camera. So these were very, very shaky shots; and the perspective was all over the place. In those instances, we had to steady the shot first, and then roto from that.”

One shot in the apartment revealed the Crow looking at himself in a mirror, then smashing the mirror with his fist, making his face appear fragmented in the broken glass. To create the shot, the production supplied Dream Quest with a meager sixty-seven frames of Lee that had been shot outside, a plate of a mirror and a plate of the room that was to be reflected in the mirror. “They also sent a shot of a stand-in looking at himself in the broken mirror,” noted Landry, “to give us a reference of how the shot should really look.”

Like the previous shot, the exterior plate of Lee was far from steady. “To steady the plate,” Landry explained, “I used some little dots on the wall as reference and tracked them frame by frame, superimposing the mirror over the image.” The plate of Lee also featured an inappropriate yellowish cast due to a fire burning in the alleyway location. “We had to do some pretty extreme color correction; and because the firelight created a kind of flicker on him, we had to put some subtle flickering in the mirror plate. It plays okay, though, because in a previous shot it was set up that there was a candle sitting on the dresser.

“In order to make him look as if he were reflected in a broken piece of glass, I had to break up his image. To do that, I used a standard displacement map technique. We established a gray-scale image that told the computer how to displace that image in any given area according to the brightness of the pixels. The intensity of the data in the displacement map represents how much the computer shifts that little piece of image left or right or up or down. The higher the intensity, the more that piece gets shifted. So I just went through with a paint program and arbitrarily assigned shades of gray. If I wanted the image shifted more in a particular area, I would lighten or darken that area. That was where the reference footage of the stand-in really came into play, because it showed us how it should look. After I was done with that process, I had an image that looked fragmented. At that point, it was a matter of sandwiching the room background, the fragmented image of Brandon and the mirror.” To justify Lee’s rain-soaked appearance – the original footage had been shot in a rainstorm – the production incorporated insert shots establishing the apartment’s leaky ceiling into the scene.

For a subsequent scene in which the character, now in full Crow makeup, looks out from the window of the apartment, a digital face replacement technique was employed. “It is an exterior shot looking into the window,” explained Burdick, “and we see a stand-in in silhouette. Then there are a couple of lightning flashes – and that is where we had to see Brandon’s face. So at that point we literally painted his face onto the stand-in’s body using paintbox software.”

The first step was to track the motion of the stand-in’s face in the scene. “Next we had to track Brandon’s facial movements in the plate – which, again, hadn’t been shot for this particular scene. After tracking both images, we positioned and sized Brandon’s face so that it would lay over the stand-in’s face perfectly. The split was just outside the hairline – most of the hair you see in the shot was the stand-in’s – and because he had dark hair, it was a great place to hide the split.”

Once the two elements were lined up, the digital team executed color corrections to create a better match. “That function was performed on the Brandon image to make his color look the same as the stand-in’s in the real lighting. The final step was the actual painting; and that was done on a frame-by-frame basis, primarily to smooth out and hide the matte lines. Because we were dealing with running footage, we had to be extremely careful about any variation around the mattes that could cause chatter. It took us about three passes to perfect it. The scene flashes by in an instant, but it was a laborious task to get it just right.”

The third type of shot, in which the background rather than the image of the character was altered to make a shot fit within a new context in the story, was showcased toward the end of the film when the Crow has avenged himself and killed one of his murderers. “There were two very quick cuts where they showed an extreme closeup of Brandon’s face,” Burdick said. “He was supposed to be in front of an orange-ish background that was highly out of focus. But in the plate we had, he was in front of a steel-blue background. So we matted out his face, used that matte as a protection, changed the color of the background, and then placed his image back into the altered setting.”

For Dream Quest, *The Crow* – which started as a traditional effects assignment but became a bizarre foray into creating a cinematic afterlife – was shrouded by a sense of loss and sadness. “Obviously,” Burdick concluded, “it was a very sensitive thing. Painting a dead man’s face onto a stand-in’s, extending his performance from one scene and putting him into another – that’s not the kind of thing we are usually called upon to do. But other than a complete rewrite and reshoot, it was the only way this movie could have been finished.”



To finish *The Crow* after the tragic on-set death of star Brandon Lee, the producers engaged Dream Quest Images to provide seven critical shots of the actor that had not yet been filmed. Using digital techniques, footage of Lee that had been shot for use elsewhere in the movie was isolated and incorporated into new photography.

VIDEO BEAT

MIDAIR MORPHING

article by Marc Derro

Soaring across the airwaves from *Metropolis* into our homes, George Reeves was *Superman* for an entire generation of television viewers – despite the fact that his unimpressive flights exhibited little supernatural grace. Leaping out of windows in one shot and into a bad matte the next, Reeves' *Superman* – bound by the limited budgets and technology of television in the fifties – kept his airborne exploits to a minimum.

Then came the *Superman* movies starring Christopher Reeve. Boasting feature film budgets and improved effects technologies, the *Superman* tetralogy introduced flying sequences that were far superior to earlier efforts.

Now, with *Lois and Clark: The New Adventures of Superman*, the *Man of Steel* returns to the small screen; and with a little help from the digital effects wizards at VisionArt Design & Animation and the effects artisans of Praxis Film Works, he is flying more smoothly, more powerfully and more convincingly than ever before. In a marriage of traditional and digital effects, flying sequences for the two-hour pilot episode were achieved by morphing from a live-action shot of *Superman* on a wire rig to a computer generated flying *Superman* model – and unlike most morphing effects, which already were showing signs of overuse, the transition between the two had to be totally imperceptible.

Originally, the three flying sequences in the pilot episode were slated to be accomplished optically through the employment of traditional motion control and traveling matte photography. At the urging of effects supervisor Elan Soltes, however, the show's producers eventually overcame their reluctance to delve into the digital arena, and entered into discussion with Santa Monica-based VisionArt. "They were still planning on using traditional visual effects for the series," stated VisionArt production manager Josh Rose, "but for the pilot they wanted to pull out all the stops."

In the first of the pilot's three flying scenes, actor Dean Cain – in full *Superman* regalia – is seen leaping out a window and across the *Metropolis* skyline. In the second, *Superman* – this time disguised as Clark Kent, attired in a trenchcoat – takes off from a dimly lit alleyway. The third reveals Kent – in casual sports jacket – flying away from outside Lois Lane's apartment building into the night sky. In each instance, the takeoffs were initiated practically, with Cain flown on wires. Dynamic long shots which follow, however, were achieved with a computer generated replica of the actor. VisionArt's mission was to create a morph that would seamlessly connect the live-action with the computer generated imagery.

Earlier, VisionArt had produced Emmy-winning morphing effects for the 'Odo' character featured in *Deep Space Nine*. Though morphing technology would be used in *Lois and Clark* to transfer from the live-action *Superman* to the CG model, it was specified that the effect had to be completely invisible. "When we morph Odo into his blobby state," Rose commented, "everyone is supposed to know that it's happening. But for *Lois and Clark*, it was important that we not see the change occurring. We were doing a good job only if no one realized we were doing anything."

To accomplish the effect, VisionArt first needed to construct a digital model of Cain. To this end, plaster molds were made of the actor's body for computer scanning. That approach was scrapped, however, in favor of one that was more direct. Cain was flown to Cyberware Laboratory in Monterey where his body was laser-scanned. Working on state-of-the-art Silicon Graphics workstations, and employing the available Cyberware data as well as the Prisms program from Side Effects Software, the team at VisionArt spent four weeks generating a three-dimensional, fully articulated *Superman* model. "Essentially we had to build three bodies," recalled Rose. "It wasn't as if we were using a paper doll where we could take off his clothes and put on different ones. So we had to build a body in the *Superman* suit, a body in the trenchcoat and a body in the sports jacket – one model for each of the three separate shots."

The live-action for each scene was photographed by The Site – a division of Praxis Film Works – using motion control technology. "Our involvement was with the first unit, almost exclusively," explained Praxis president Robert Blalack. "We did about five days of greenscreen wire flying. There were a number of different angles that we shot – some as library footage – right there on the live-action set. One shot, in particular, required a tilt-up as *Superman* races off into the sky. We did the tilt-up – with Cain traveling as far as he could on the rig – and then VisionArt took over from there and morphed him into a CGI *Superman*." Praxis also executed a number of real-time motion control shots. "We set up an Arri 535 on our motion control system so that the DP could live-action-encode a camera move following the *Superman* character in on wires. The camera would then repeat that move to provide a clean background so they could take the wires out. The miniature shoot was done at The Site, and the live-action was done on location with the portable system. For us, the most important thing was that the motion control proved fast and completely workable, even in the fast pace of a television shoot. It took no longer to set up than a traditional dolly track."

For the first scene of *Superman* flying out a window and across the *Metropolis* skyline, Praxis filmed Cain 'flying' towards the window, suspending the actor on a wire rig. Next, the shot was duplicated without Cain, producing a clean plate for effects compositing. VisionArt then scanned both plates in at standard video resolution, and animators used the motion control data to sync up the CG character's moves with those of Cain. Once synchronized, the image was manipulated and articulated so that *Superman* appeared to fly out the window and into the distance.

After the computer generated model had been synced and animated, it was placed into the shot by way of morphing. A morph program called Mojo – also created by Side Effects Software – was employed by VisionArt to merge the live-action figure with the digital animation. To complete the effect, film grain was added using VisionArt's own proprietary software.

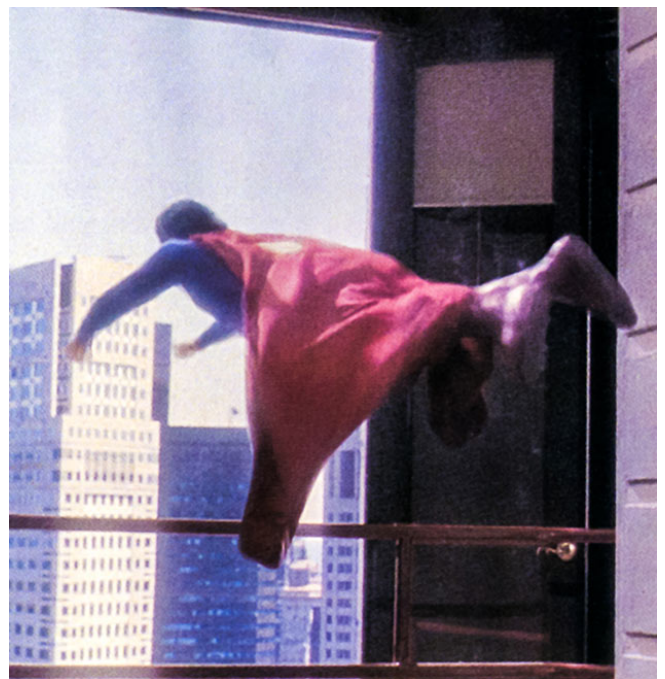
The same process was employed in a subsequent flying scene in which *Superman* – disguised as mild-mannered reporter Clark Kent – takes off from a dimly lit alleyway. Here again, the motion control camera follows Cain skyward as he ascends via the wire rigging, with VisionArt's digital model completing the flight into the night sky.

Of the three flying scenes, the last proved the most challenging. The shot was to reveal *Superman* hovering outside Lois' apartment, then flying away. Due to overall production limitations, VisionArt was provided with nothing but a motion control tilt-up on a miniature building and a less-than-satisfactory shot of Cain being flown away on a wire rig.

"Because there wasn't a good shot of Dean flying away from the building," Rose recalled "the takeoff had to be accomplished with our CG model. So in that case, there was no morphing from the live-action character to the CG character – it was all CG. That was hard to sell because you could see his face, his glasses – everything – and it all had to be computer generated." Complicating the shot even further was the producers' late-date decision to reveal *Superman* flying across the moon as he ascended into the night sky. "The plate they gave us had no sky, no moon – nothing. So we had to composite a starry sky; and we had to build and composite the moon."

Because the pilot episode was filmed using a 16:9 aspect ratio to accommodate a European theatrical release, all of VisionArt's digital effects had to be produced in anamorphic format. Once composited, the shots were fed into an Abekas digital disk recorder where the images were pulled out and restored. Responsible for transferring all of the show's effects from video to film, VisionArt used proprietary software to bump the video resolution up to 2K for theatrical use.

Budgetary constraints had preordained that digital morphing for the flying sequences be abandoned in favor of more affordable greenscreen effects for the weekly episodes following the pilot. But that bottom-line decision did not negate the resounding success of the digital effects showcased in the premiere installment of the *Lois and Clark* series. "No one had ever produced such a seamless morph from a live-action character to a CG model," Rose concluded. "No one can see it. We have challenged people to pick out where the morph takes place; and they never



pick it at the right time – it always happened much earlier than they thought. You can only get Dean Cain to agree to go out a window so far!”

For young Superman's takeoff scenes in the pilot episode of Lois and Clark, live-action greenscreen material of actor Dean Cain on wires was filmed by Praxis Film Works, then morphed midshot into a computer-generated flying character at VisionArt Design & Animation.

THE MAKING OF A ROCKBUSTER

image

article by
Jody Duncan



*More than thirty years after Hanna-Barbera debuted the animated show on prime-time television, *The Flintstones* opened as a fullblown live-action feature from Amblin Entertainment and Universal Studios. Filling the pivotal roles of Stone Age pals Fred Flintstone and Barney Rubble were John Goodman and Rick Moranis.*



*Under director Brian Levant the familiar cartoon world of *The Flintstones* was recreated in three dimensions by production designer William Sandell and his art department. Among the more elaborate sets was downtown Bedrock. Built at a working quarry in the San Fernando Valley, Bedrock featured carved plaster stores and restaurants that like the TV series, parodied modern-day institutions. Also included was a play area dubbed Jurassic Park.*

It's as instantly identifiable a ditty as one is likely to hear. First come the horns, blaring in loud and brash, as Fred Flintstone – an overweight, fortysomething working man wearing an abstract leopard print tunic and a bright blue tie – is revealed working big-rig controls atop a resigned, dim-looking prehistoric beast. The happy theme music continues as a foreman checks his sundial watch and signals the end of the workday by pulling the tail of a 'whistle bird.' With an exuberant 'Yabba Dabba Doo', Fred slides down the tail of his brontocrane and flies into his waiting car. Then start the lyrics, inviting us to meet the Flintstones, a modern Stone Age familiee...

For close to thirty-four years, the familiar opening to *The Flintstones* cartoon show has been watched by millions of people all over the world. Despite the original show's cancellation in 1966, syndicated reruns and dozens of first-run specials have secured the Flintstones' place in American pop culture; and through the years, the cartoon likenesses of Fred, Wilma and Pebbles Flintstone, and their neighbors, Barney, Betty and Bamm-Bamm Rubble, have been used to sell everything from cigarettes to cereal to children's vitamins.

And now, *The Flintstones* comes to us as a Hanna-Barbera/Amblin Entertainment live-action feature from Universal Pictures. Translating the beloved animated program into three dimensions entailed one of the biggest production design efforts ever launched at Amblin, as well as the cooperative effects efforts of Industrial Light & Magic, Jim Henson's Creature Shop and Michael Lantieri's special effects team.

Though it had purchased movie rights to the show in 1989, Amblin had subsequently committed itself to other large-scale projects such as *Hook*, *Jurassic Park* and *Schindler's List* while *The Flintstones* remained in ongoing development. During an almost five-year period, a succession of scripts was commissioned – and rejected – while the start of official production continued to be postponed. Finally, in the fall of 1992, Amblin and Universal decided to go forward with the project, despite the fact that a satisfactory script was still not in hand.

The turning point for *The Flintstones* came with the hiring of director Brian Levant. Levant – who had built a respected reputation within the television industry as a director, writer and producer of family comedies such as *Happy Days* and *The New Leave It to Beaver* – had recently parlayed those skills into a solid filmmaking career with his second feature, the Universal comedy *Beethoven*. A lifelong fan of *The Flintstones*, Levant had repeatedly expressed to Amblin an interest in writing the script – overtures that were disappointingly unfruitful. But with the success of *Beethoven* – which



Downtown Bedrock's favorite fast-food establishment. Thousands of Flintstone-style props – including oversize burgers and fries – were fashioned by an unusually large prop and set dressing crew.

went on to gross more than \$143 million – Amblin’s interest in the neophyte director magnified, and Levant was promptly hired to both write and direct *The Flintstones*.

Bringing on a team of television writing colleagues, Levant quickly produced a script that captured the essence of the original show. That essence included visual gags that poked gentle fun at the materialism of modern life during the fifties and early sixties, and verbal gags that made Stone Age parody of well-known celebrities and consumer goods. Most importantly, Levant’s screenplay – unlike the previous attempts – captured the basic sweetness and naiveté that accounted, in large part, for the original show’s enduring charm.

The story conceived by Levant and his writing team begins at the Slate & Company quarry where junior executive Cliff Vandercave (Kyle MacLachlan) and his sultry accomplice Miss Stone (Halle Berry) are plotting to embezzle millions from the company. In need of a simple-minded patsy to inadvertently help them carry out their plan, the villains arrange for the quarry workers – including Fred (John Goodman) and Barney (Rick Moranis) – to take an aptitude test as a means of selecting a candidate for promotion to vice president. In gratitude for a loan from Fred that enabled the Rubbles to adopt son Bamm-Bamm, Barney exchanges his relatively high-scoring test for Fred’s failing exam and, as a result, Fred moves into the coveted executive position. The Flintstones embrace their newfound prosperity at the expense of their friends, but when the embezzling scheme is eventually uncovered, all fingers point to Fred, and it is up to Wilma (Elizabeth Perkins), Barney and Betty (Rosie O’Donnell) to clear his name.

With a suitable script finally completed, Universal gave its blessing to the project, and executive producers Steven Spielberg, Gerald R. Molen and Kathleen Kennedy began assembling the key production staff. Bruce Cohen, who had served in a variety of producing and assistant directing capacities at Amblin since *The Color Purple* in 1985, came on board to produce *The Flintstones*, while Colin Wilson – a veteran of *Jurassic Park* – signed on as co-producer.

Also brought onto the project early on was William Sandell, a production designer with an impressive list of credits, including *Total Recall* and *Hocus Pocus*. Sandell’s early participation was crucial because the entire cartoon world of the TV show – the town of Bedrock, the suburban Flintstone neighborhood, the Slate & Company rock quarry, plus interiors, props and cars – would have to be created entirely by the art department.

Working under Sandell, production illustrator Marty Kline began the design process with hundreds of pencil sketches depicting life in the Flintstones’ world. “It started with me,” Kline said, “because getting something on paper was a way to get things rolling. It was important that we get something down, if only so that Brian could say, ‘No, that’s not what I had in mind.’” Despite the relative flatness of the artwork in the original cartoon, the art department found inspiration in the animated programs, particularly in regard to visual gags and an overall style. “We had people going through all the Flintstone cartoons for gag ideas – the phonograph birds and baby strollers and that sort of thing. We also looked at the cartoons for the basic sense of design. Overall, it was a cartoon version of the late fifties or early sixties, done in stone. I drew tables and chairs and other pieces of furniture, thinking in those terms. Eventually, we got photographs of real period furniture so we could figure out how to do stone renditions of it. Because all of this stuff was so unusual, we couldn’t just rely on drawings to get a feel for it – no matter how many drawings we did. We had to

build things and paint them and finish them before we could really see what we had. That was the point at which the cartoon stopped being helpful.”

Working closely with art director Jim Teegarden and artist Tim Flattery, Kline began with depictions of the Flintstones’ suburban street – a set that was slated to be built at Vasquez Rocks, a protected natural park in northern Los Angeles County which for decades had served as a location site for countless movies, particularly westerns. “Both the Flintstone and Rubble houses were on one side of the street, right next to each other,” Kline explained, “and we incorporated a kind of spire-like roof on them to match the spires at Vasquez Rocks – so it would look as if the houses really belonged there.” In part to protect the rare plant life found at Vasquez Rocks, the tract-style houses were built of lightweight foam at Universal, then transported and carefully positioned on prepared pads at the site. The completed street set was approximately three hundred feet long, and included five additional houses, lawns, cobblestone sidewalks and foam-carved, cartoon-style trees.

The entire town of Bedrock was also designed and constructed as a major location set. Built at the CalMat quarry in the San Fernando Valley – a working quarry that featured dramatically sheer cliffs, rocky plateaus and a natural lake – the Bedrock set included a Chevrock gas station, Roc Donald’s restaurant, Bank of Ameroka, Marshy Fields department store, the Bowl-O-Rama bowling alley, and a children’s play area called – what else? – *Jurassic Park*.

The quarry site was also home to the Slate & Company headquarters and quarry, plus the drive-in theater featured in the film’s opening sequence. The headquarters building – a huge edifice made to look like black marbleized rock – and the surrounding quarry evolved from simple pencil sketches. Even the boulders that were to dress the quarry set had to be sketched. “You’d think we wouldn’t have needed drawings of rocks, but we found that we did. It was pretty funny, drawing these eight-and-a-half-by-eleven prop sketches of rocks; but we needed them so that Brian could say, ‘Yes, that kind of rock’ or ‘No, not that kind of rock.’” Lightweight foam rocks were blended in with actual boulders at the quarry location, and were used not only for dressing, but also for scenes in which the brontocrane – a mechanical rig – would have to lift the giant boulders in its jaws. “There was no way a rig could have lifted real boulders that size. We had to make sure that the rocks were lightweight and controllable.”

Construction of the downtown Bedrock and Slate & Company sets was impeded by a continually rising water table at the CalMat location. Situated some two hundred feet below the San Fernando Valley floor, the quarry was vulnerable to runoff from the preceding winter’s unusually heavy rainfall. Time and time again, the production team would lay out an area for construction, only to return to find their site covered with as much as thirty feet of water. In one instance, a major set was already well into construction when water began to rise precariously. The company had to move to higher ground.

In addition to the exteriors built on location, a number of interior sets were constructed at Universal Studios. Interiors of the Flintstone and Rubble houses, the Slate & Company headquarters, and both the exterior and interior of the Cavern on the Green nightclub were all extensive sets calling for customized dressing and props built from scratch. The Cavern on the Green was particularly complex. Set at Stonehenge, the nightclub was represented by full-size

plaster replicas of the ancient rock formations, as well as a massive surrounding cyclorama depicting a distant volcanic terrain.

After six months of preproduction, principal photography began in May 1993 and continued until early September. Commencing with a short prologue in which Vandercave and Miss Stone are introduced, the movie launches into a shot-by-shot live-action recreation of the original cartoon show's opening. Fred Flintstone is revealed at work atop his trusty brontocrane at the rock quarry. Reprising an approach that had produced artfully realized dinosaurs for Spielberg's *Jurassic Park*, the Amblin production team elected to create the brontocranes – and all the fanciful creatures in the production – through a combination of full-size animatronic rigs and computer generated imagery.

Coming onto the project relatively unschooled in the technicalities of digital effects, Levant elected initially to limit the computer graphics to a mere nine shots, and planned to realize the majority of the creatures through animatronic puppets. This hands-on, practical approach, Levant reasoned, would result in a more spontaneous shooting environment on the set. “The whole joke in the television series,” Bruce Cohen noted, “was that these creatures talked and had personalities. So we wanted them on the set, interacting with the actors, letting the actors play with them as characters. It was a performance thing; and we knew that meant puppets.”

Looking to recreate the comedic, endearing qualities of the cartoon creatures, the filmmakers turned to Jim Henson's Creature Shop, a thirteen-year-old, London-based establishment with a stellar reputation for creating humorous, performance-driven characters for both television and film. “When *The Flintstones* project came up,” said Creature Shop supervisor John Stephenson, “it seemed very much like our sort of movie. So I think we were obvious contenders for it.”

Coming onto the project in early February, the Henson team had only twelve weeks in which to deliver more than twenty Flintstonian creatures for the start of principal photography in May. Upon accepting the assignment, Stephenson and chief designer Jamie Courtier flew immediately to Los Angeles for a series of design meetings with the Amblin production team. “The design phase for the creatures was very intense,” noted Colin Wilson, who oversaw the creature effort. “After flying out for meetings with Brian and Bruce, Jamie and John went back to London and Jamie continued to fax drawings to us for Brian's approval.” Throughout the six-week design period, various concept renderings were proposed and approved, then replicated as six-inch resin-cast maquettes which were fully detailed and painted. In a final round of approvals, the maquettes were transported to Los Angeles where the producers and director signed off on the designs.

Approvals in hand, Courtier and Stephenson returned to London where the creatures were sculpted full-size in clay. “We then began molding,” Stephenson said. “At the same time, our mechanical people started doing their work. Then, once the molds were done, we started producing skins in either silicone or latex. The final step was putting the skins onto the mechanical understructures.”

The largest of the Henson creatures was the brontocrane. Designed to resemble a brontosaurus –



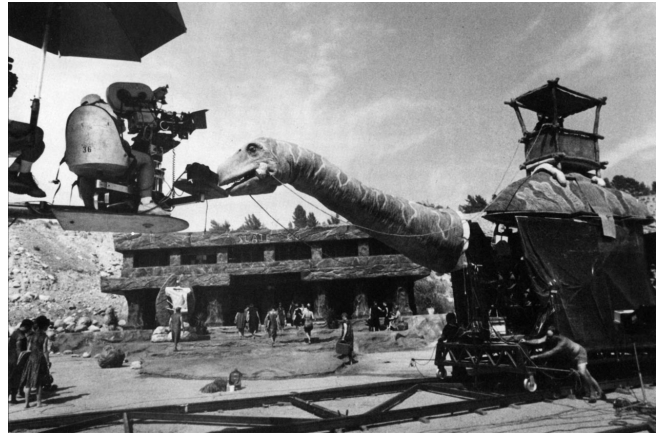
an appellation supplanted by 'apatosaurus' since the original show's demise – the brontocrane was sculpted by Graham High and Barry Sutton to reflect the humorous and fanciful style of the Flintstones cartoon. "All the designs had to have a warmth and a look around the eyes that made them friendly,"

Courtier explained. "But since this was a live-action

feature, they also had to be based in reality. In the cartoon, all the creatures were very brightly colored; but if you put a brightly colored creature next to a live human being, it suddenly looks very out of place. So we muted all the colors down. The brontocrane was originally blue and brown; and when it was freshly painted it looked remarkably vivid. But on the set, we wound up rubbing earth into it to mute the color down and make it look more appropriate to the surroundings at the quarry."

Measuring sixty-five feet from head to tail, the brontocrane rig was mechanized and skinned only in the specific sections that would be revealed in relatively close shots – the head and neck, the back section and the tail – since all of the full-body wide shots of the creatures were slated to be produced via computer animation. "We had a separate team, supervised by Verner Gresty, building and operating the brontocrane," stated Henson on-set supervisor Chris Barton, "just because it was such a large and complex item. Due to the sheer size of the head, we used linear actuators, which are motors that have a long linear movement and are quite powerful. These were used for the bigger head movements. Then, for the smaller functions of the head, such as the eyes and eyelids, we used servos." The animatronic head was situated on a twenty-foot-long neck actuated by cables and hydraulics. "Each moving section of the bronto neck was comprised of computer-machined aluminum box sections arranged as parallelograms, individually cabled back and counterweighted at the base. The cables were used to provide up-and-down and counterbalance functions, and the lateral movements – including all the head movements – were supplied by a passive hydraulic system. This approach resulted in a head that moved gracefully, and at the same time was beautifully controllable. Each section of the neck was controlled by one puppeteer; and it took about eight puppeteers in all to operate it. We also had two tails: one that was mechanized to sway from side to side, and another rigid fiberglass version that was used for the shot of Fred sliding down the brontocrane's tail in the opening. The back of the rig had a simple mechanism so that it could rock side to side and create the impression of some movement for shots of Fred in the cab, working the controls."

Taking the lead from the realized show, the Flintstones were pulled together by a host of additional artists, including Megjarian, some of the original designers, and others. The Flintstones were designed by the top of the animatronic world, and the Flintstones were designed by the top of the animatronic world.



At the quarry location, special effects supervisor Michael Lantieri mounted the Henson brontocrane on tracks to provide a general forward movement. A crane was employed to transport the massive rig from one location on the set to another.



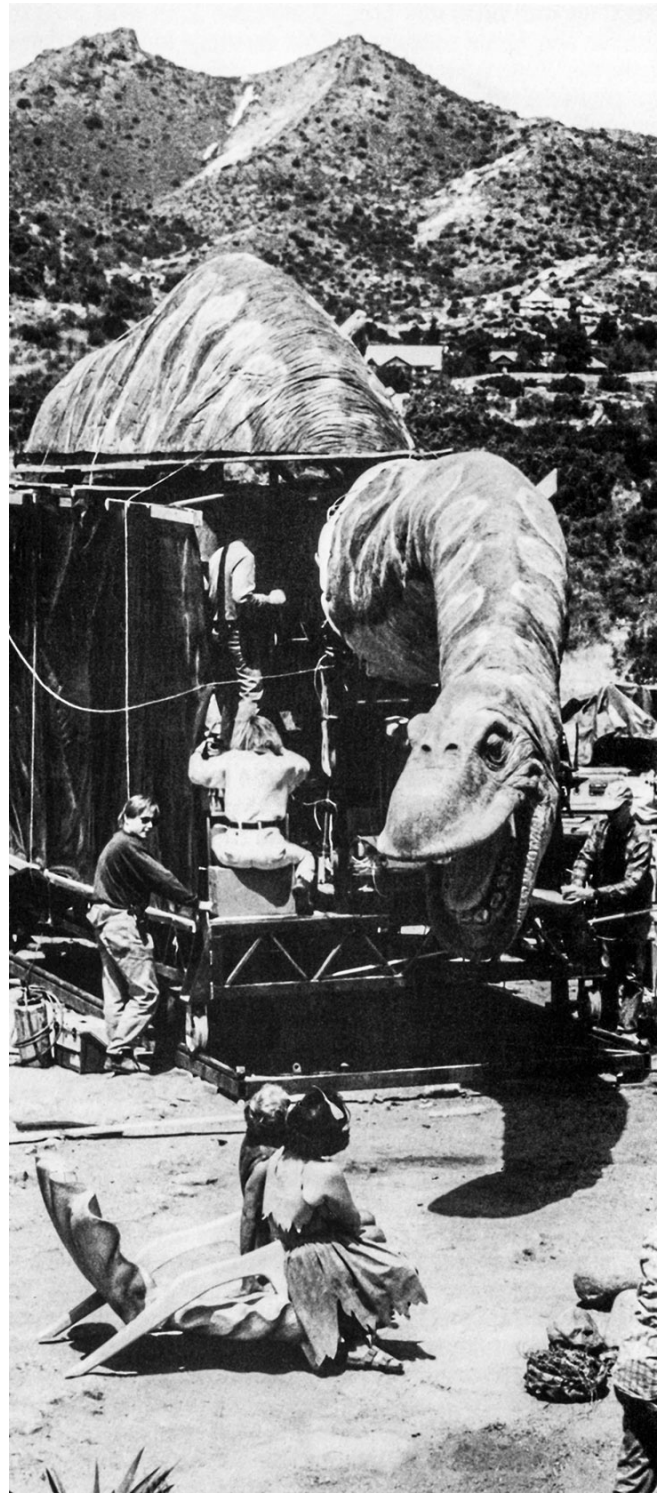
One of the quarry workers maneuvers a brontocrane. Nearly sixty – five feet long, the Henson bronto rig consisted of an animatronic head atop a hydraulic and cable-operated neck, a large hump-back with cab for the actors, and a mechanized tail.

To propel it forward, the entire brontocrane was mounted on a track by Michael Lantieri and his special effects crew. Having just come off *Jurassic Park* – a project on which he had had to wrangle Stan Winston’s huge hydraulic tyrannosaurus rex – Lantieri was well acquainted with the challenges of dealing with such large-scale rigs. “Michael played a big part in the brontocrane, simply because of its size,” asserted Barton. “His whole crew provided terrific support for us. In addition to rigging the track, Michael also arranged for a large crane to be on hand so that the whole rig could be picked up and moved from location to location at the quarry.”

In addition to the brontocrane, the opening sequence also showcases the whistle bird – a fanciful, chicken-sized prehistoric bird that, with a pull of its tail, screechingly pronounces quitting time at the quarry. “The body mechanism was quite ingenious,” noted Barton. “When the tail was pulled, the bird would tip back, and the same mechanism would open the wings and throw the head back. The actor would just pull the tail, and that would engage the tipping mechanism and the wing spread. The head – which had three or four servos in it and was operated from off-camera by radio control – had eyes that blinked; and there was a small motor in the tongue that made it waggle as if it was screaming in true siren style.”

Demonstrating remarkable grace for a man of his bulk, Fred skates barefooted down the tail of his brontocrane at the whistle bird’s signal. To achieve the stunt, Goodman’s double was hung on wires by the special effects crew and guided down the length of the rigid fiberglass tail, then swung off the end to suggest Fred’s flying leap into his waiting car. To realize the subsequent shot of Fred descending into the car, Goodman was pulled from the car by crane, and the action was photographed in reverse. On playback, Fred appeared to fly into the car in true cartoon style. The wires employed in both shots were removed digitally in postproduction.

Lantieri headed the construction of Fred’s familiar canopy-topped car and all the other Flintstone-style vehicles featured in the movie. Altogether, approximately twenty different models were



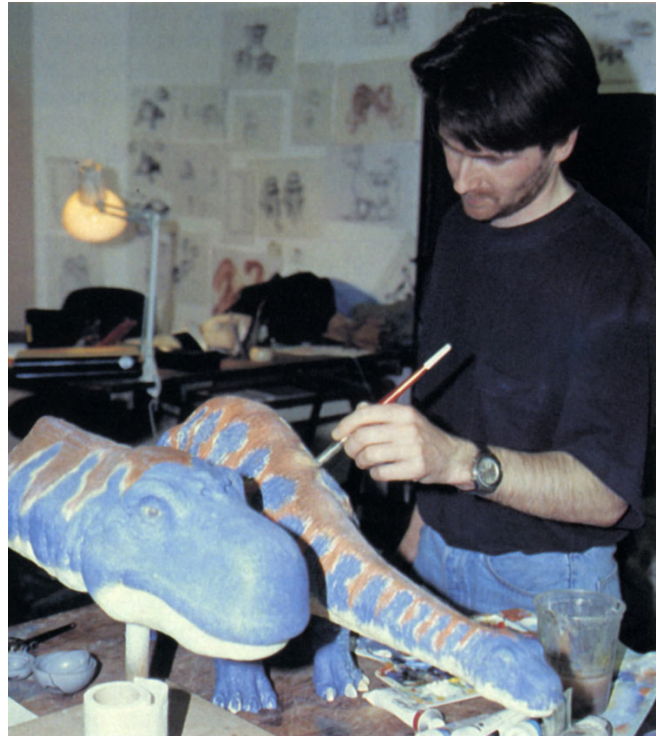
Rick Moranis and Rosie O'Donnell prepare for a shot as the creature crew readies the brontocrane. Up to a dozen puppeteers were required to operate the rig.

devised for the show – seven of which were motorized while the remaining background vehicles were simply pulled by cable or pushed into scenes as needed. “Fred’s was obviously the hero car,” Lantieri stated, “so it had to be self-propelled, without any of the motors or mechanisms visible – especially since, in the Flintstone world, all of the cars are supposedly powered by foot.”

To begin the design of Fred’s car, Lantieri studied a toy version provided by Brian Levant from his personal collection of Flintstones memorabilia. “We found that we really had to be true to the original designs, because everyone grew up on *The Flintstones* and everyone knows what Fred’s car is supposed to look like.” Construction entailed spraying foam over steel frames, then carving and painting the foam to achieve the desired look. Fred’s car was carved and painted to resemble a bark-covered timber frame with an animal hide top and steamroller wheels. “It was the hardest car to build, mainly because of the big granite steamroller wheels in the front and back. Finding a way to build those wheels and turn them was very difficult. In the end, we used steel drums covered with fiberglass skins that looked like granite. Bearings on the sides made the drums roll, and we had a system of cables and gears hooked up to a bone steering wheel to make the wheels turn.”

All the cars were battery driven, with golf cart-type motors. “The batteries had to be hidden inside the cars, and they had to be charged every night. I had a regular group responsible for making sure they were charged and ready to go every day. Just maintaining these things was a full-time job. The cars were being driven over uneven, rocky ground, and the paint would get chipped or things would come loose; so every day we had to go over them and make sure they were in good working order.” To facilitate obligatory shots of feet running beneath the vehicles, the frames of the cars were raised slightly and hidden gas pedals were connected to small buttons the actors could conceal in their hands. “John Goodman, for instance, would use this hand switch to make the car slowly accelerate as he started running. Then, as he got going faster, he would just pull his feet up and take off.” For shots in which the characters’ feet were not visible – tight shots on Fred and Barney talking inside the car, for example – the actors would accelerate the vehicle through the hidden gas pedal in the floor.

As the opening sequence continues, Fred pulls out of the Slate & Company quarry gates and stops to have his timecard punched in the jaws of the stegosaurus time clock. Unlike the majority of the Henson creatures – which would be operated on interior sets that were elevated to accommodate the puppeteers – the stegosaurus was rigged and puppeteered under the somewhat rugged conditions at the CalMat quarry. The full-size creature was mounted on a pole arm, its huge head protruding from a hole in a wall and its hump visible behind the small time clock shack that served to hide both the pole and the attending puppeteers. “The stegosaurus was built by Kevin O’Boyle and Bob Thorne,” Chris Barton stated. “The head was about a foot and a half long, and the neck was about three feet long. The hump rising up from behind the wall was also very large – about seven feet long, five feet wide and five feet high. The puppet had a real hefty jaw mechanism so that when the foam timecard was placed in its mouth, the mechanism had the power to punch holes into the foam. The creature had a very long jaw, so that mechanism had to be quite strong. It also had a cable neck. So there would be two or three puppeteers inside the hut, and then one more puppeteer off-camera operating the servo-driven eyes through the Henson Performance Control System.”



With only a tight twelve-week period in which to design and build two dozen animatronic characters, the Creature Shop produced fully detailed resin-cast maquettes based on drawings rendered by Henson designer Jamie Courtier.



The mechanical tail section of the brontocrane rig was cable-operated to achieve a natural swaying motion. A rigid fiberglass version was built for a shot of Fred sliding down the animal's tail.



Originally painted in bright shades of blue, the brontocrane was later toned down on set – by rubbing dirt into its foam latex skin – when its coloring appeared too vivid for the live-action environment.



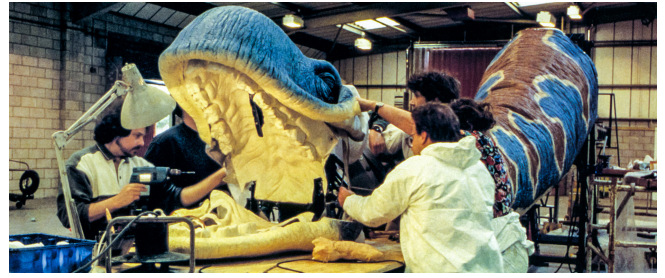
After maquettes had been approved, the brontocrane was sculpted in full size. Mechanical armatures were then covered with skins cast from molds. Linear actuators were used for the large head movements, while servos drove smaller functions such as eye movements.

The Henson Performance Control System – which was honored with a technical achievement award from the Academy of Motion Picture Arts and Sciences in 1992 – is a computerized system that allows a single puppeteer to control any number of mechanisms to produce a variety of expressions on an animatronic puppet. “The puppeteer places one hand into a kind of glove assembly on top, which he can open and close with his fingers,” Barton explained. “On his other hand, he has a

multifunction joystick that has a control for each finger and also swivels left to right. It also has four axes for the body. Because all these output controls can go into the computer, and then into the creature and the servos in the head, any number of servos in the creature can be dedicated to any part of the control system. So the joystick allows a puppeteer to set up expressions – happy, sad, angry, whatever – and those are all preset. The puppeteer programs those expressions in so that moving the joystick to certain positions will create those expressions on the creature automatically. The puppeteer can also preset the degree of expression by setting the extremes – most expression and least – at either end of the joystick, thereby affording himself proportional control of the character. Preset expressions can always be overridden, so the puppeteer still has a lot of freedom and creativity in coming up with expressions and a performance. The system is very sophisticated; and once a puppeteer is accustomed to it, he can become quite adept at setting it up for any given shot.”

Following the cartoon opening precisely, the camera next reveals Fred pulling up to the exterior of the Flintstone house. Fred, Wilma, Pebbles and Dino pile into the car for a family excursion to the drive-in movie theater – which, the sign tells us, will soon be featuring Gorge Lucas’ Tar Wars. Just as in the animated show, Fred parks at the drive-in, placing a giant shell speakerphone to his car side as Dino pops his head up through the roof. Because the scene would feature a computer generated Dino, the special effects team was responsible for creating the roof-popping effect during the live-action filming. Lantieri and his crew used a Tupperware tub as a stand-in for Dino’s head, pulling the tub through the prescored top of the car with wires until it broke through the fake hide.

The opening theme music comes to an end as the camera pushes in toward the drive-in movie screen. On the screen, the ‘Univershell’ logo is revealed – a globe appropriately altered to reflect the Pangaea of prehistory. The camera continues to move in through the globe’s atmosphere, soaring past a pterodactyl airliner with a dozen Stone Age passengers aboard, skimming across a lake in which two Loch Ness-type monsters play, moving over rocky terrain, and finally coming to rest on a sign that reads: ‘Welcome to Bedrock – First with Fire,’ with the bustling town of Bedrock revealed in the distance.



Brontocrane head and neck sections are assembled by the Henson team.



The Creature Shop also built a stegosaurus time clock for the quarry. Mounted on a pole arm and operated by a team of puppeteers concealed within the shack, the stegosaurus was equipped with a powerful jaw mechanism capable of punching holes into inserted foam time cards.



Fred and Barney do a rendition of 'The Twitch' on their drive home from work. Michael Lantieri was responsible for building the vehicles in the film, including Fred's familiar wood-and-granite model. All were fashioned out of foam carved over steel frames, and some were powered by battery-driven golf cart motors.

Industrial Light & Magic was responsible for creating the forty-five-second-long shot – its longest digital shot to date. In fact, initially it was to be ILM's major contribution to *The Flintstones*. "When we first came on the show," recalled visual effects supervisor Mark Dippé, "we were only going to do a small number of 3-D computer generated shots, and the rest of our shots were going to be rod removals and composites. One of the major shots was the opening, which we think of as the big roller coaster gag that gets you into Bedrock. We called it the 'Powers of 10' shot – after the Eames movie that starts on a front lawn, then pulls back until you see the earth, and then the solar system and then the galaxy. In *The Flintstones*, we got that same kind of effect in one continuous shot that contained a variety of elements."

For the initial push-in on the drive-in movie screen, a screen erected on location at the CalMat quarry was photographed by a camera mounted on a dolly rig with a crane arm. "On the screen we composited a computer generated version of the Universal logo. Then, as we fly into that, we go through digital clouds. When we pop out of those CG clouds, we are into real clouds that were shot from a Lear jet."

The shot continues with a closeup view of the prehistoric airliner – a computer generated pterodactyl combined with a passenger-filled cabin shot via frontlit bluescreen on stage at Universal. To simulate the rocking and rolling motion of the pterodactyl in flight, Michael Lantieri mounted the cabin set on a gimbal rig and ILM timed the animation of their CG character accordingly. "The bluescreen shoot was actually very difficult," Dippé noted. "Because the pterodactyl was so huge, the amount of movement as it passed by had to be tremendous. Also, it had to fly rather fast. So, using an electric crane – driving it as fast as it would go – we shot the cabin on the biggest available stage at Universal, running diagonally right across it. It was kind of dangerous because the camera had to sweep low, right in the face of the pilot. We also had to have a huge blue-screen, which was frontlit



A lobster lawnmower – featured in establishing shots of suburban Bedrock – was built by the Creature Shop and had mechanized claws that opened and closed to simulate grass-cutting action. Detached from the grass bag, the lobster served double-duty as a pin-retriever in a later bowling scene.

because there was not a backlit screen available that was big enough. So we put mirrorplex on the ground, which worked really well. That was the very first thing we shot on the movie.”

One of ILM’s challenges in creating the computer generated pterodactyl was shifting gears from the ultrarealism of *Jurassic Park* – which they had just completed – to the cartoon-like style of *The Flintstones*. “The pterodactyl looks the most like a real dinosaur,” observed digital artist Carolyn Rendu, “and I’m convinced that it’s because it was the first thing we tackled after *Jurassic*. For me, it was hard to go from making something that was supposed to exist in the real world to making something very fantasy-like. We were all fighting that at first. All of us had a tendency to refer to *Jurassic* because we’d been focused on that for so long. It took a while to disassociate from that and get into a more humorous vein.”

After passing through more clouds, the camera emerges to reveal a large placid lake inhabited by two creatures of the *Loch Ness* monster variety. “The lake was a plate I shot at Lake Powell from a helicopter,” Dippé noted, “working with movie helicopter pilot Robert Zajonc and aerial DP David Nowell. In that plate, we’re flying really close to the water with all these really amazing forms of rocks surrounding it. We added computer generated Nessies swimming in the lake, with little computer generated wakes moving behind them.” Designed by ILM art director TyRuben Ellingson, the giant sea serpents were strikingly patterned, colorful creations. “To develop a concept for the Nessies, we looked at serpents and Chinese dragons for inspiration. What Ty came up with were really bright, amazing-looking creatures. We put one in the background and the other in the foreground, and they look as if they are playing and calling to each other.”

Working from Ellingson’s drawings, modeler/ animator Geoff Campbell sculpted the three-dimensional Nessie in the computer. “Ty gave me a profile drawing,” stated Campbell, “and using Alias software, I tried to sculpt it out as quickly as possible, just to get an idea of what it might look like in three dimensions. I scanned in the drawing, and from that I made up my own templates – a side view and a top view – which gave me a basic idea of the volume of this creature. From that I built up spheres, which was a quick way to get a basic form. It was pretty crude, but it could be rendered out the same night to give me an idea of what it was going to look like. The model was still in wire-frame form, but I could put a surface on it and get some sort of idea of volume.” Once the basic form was determined, Campbell began refining the computer model. “At that point we could skin the model with a continuous surface, making sure that all the surfaces blended. The trick is figuring out how to get the topology just right and how to make the joints connect properly throughout the entire body. That’s where software programs such as Sock and Enveloping – techniques we developed here at ILM for *Terminator 2* and *Jurassic Park* – come in. We use Socking to put together all our joints, while Enveloping creates a kind of internal dynamic, giving us musculature that seems to bulge and move dynamically.”

Within two weeks, the computer model was completed and ready for animating. “Dave Andrews animated the Nessies,” explained animation supervisor James Straus, “and the wake surrounding them was computer generated by Carl Fredricks. The parameters of the shot were to be able to see the Nessies as the camera flies by, and have them interacting together somehow. We started with the Lake Powell plate. Inside the computer, we built a landscape to simulate the real landscape at Lake Powell – all done by hand – which told us where all the water was supposed to be, and the mountains, et cetera. Then we could place our virtual Nessie models on the water and have our

computer camera fly by, matching the helicopter camera move on the lake. When we build our virtual world, our computer camera has to fly the same way the helicopter camera flies. Because the helicopter plate photography was so bumpy and unstable, it made for some pretty wild match-moves – which were accomplished by Pat Myers.”

The extended shot continues with the camera passing over the lake, then up and over a cliff face to reveal the Bedrock sign and the city in the distance. The sign, terrain and background city were all built as a tabletop miniature, then photographed and enhanced with computer graphics elements. “In the shot,” said Dippé, “you see a little pterodactyl flying off in the distance and cars driving through the town – both CG elements. The shot also has smoke coming out of some distant volcanoes, which was real smoke that we composited in. So there was a lot of stuff that went into that one shot.”

With this introduction to *The Flintstones*’ prehistoric environment, the movie segues to Fred and Barney’s companionable drive home from work. During their friendly exchange, we learn that Barney and Betty have been approved to adopt a child, thanks to a loan from Fred. As the two best buddies arrive home, the camera reveals a suburban scene replete with typically Flintstonian twists such as kids playing ‘basketrock,’ twirling snake hula hoops and gathering around a sno-cone truck – boasting ‘New Flavor: Vanilla’ – while neighborhood dads mow their lawns with lobster lawnmowers.

The lobster lawnmowers were conceived and built by Chris Fitzgerald and Jamie Jackson-Moore of the Creature Shop, and served double-duty as pin-retrievers in a later bowling alley scene. “The lobster lawnmower was quite a rig,” noted Chris Barton. “It was a fiberglass-bodied puppet which had a lot of mini-actuators in it. Since it had to simulate the cutting of the lawn, its claws had to open and close, and move backwards and forwards through grass – which meant they had to be built tough to withstand the punishment. There was also some eye, head and tail movement. Servos controlled the head and tail movement, but other than that it was just pushed along by the actor. It was on a fiberglass trolley that resembled rock and had a wheel at each corner. The lobster looked as if it was holding onto this trolley with the majority of its legs, and then there was a handle that came up from the back.” To help sell the gag, Michael Lantieri’s crew rigged motors beneath a grass bag attached to the back of the lobster rig so that grass would spit out as the rig moved along, creating the illusion that the lobster was indeed cutting the lawn.



A wide shot of the quarry featured two ILM brontocranes. Because the computer generated animals were to be intercut with shots of the animatronic rig, the ILM team – under visual effects supervisor Mark Dippé – used both the Henson maquette and measurements taken from the full-size rig as reference in building its digital model.



The Flintstone and Rubble neighborhood was nestled among the jagged rock formations of Vasequez Rocks, a perennial movie location in northern Los Angeles County. In part to protect the rare plant life found at the site, the foam-carved tract-style houses were constructed at Universal Studios, then transported to the location and mounted on specially prepared pads.

Securing his steering wheel with a Stone Age version of *The Club*, Fred enters his abode, only to endure Dino's overzealous greeting. A running gag in the cartoon show, Dino's exuberant response to Fred's homecoming begins with a shot of the pet jumping up at the sound of his master's voice, then attempting to gain traction on the slippery living room rug. Finally, Dino runs towards the door and charges Fred, knocking him down and licking him as his tail wags with enthusiasm.

Of all the prehistoric characters featured in the movie, none was as problematic – from design through execution – as Dino. In part, the 'Dino problem' stemmed from the fact that the original character in the TV series was rather loosely designed. Unfettered by the physical constraints of live-action photography, the Hanna-Barbera animators had rendered Dino in a variety of sizes and attitudes, as scenes warranted. Shots of characters riding upon the animal's back revealed a hefty, brontosauruslike Dino; whereas shots of Fred holding the pet in his arms had Dino as a cuddly, puppy-sized creature.

For the live-action feature, the original idea had been to portray the character through a closeup animatronic head intercut with a human performer in a Dino suit. From the start, the man-in-a-suit approach presented complications in designing the animal, since human anatomy had to be taken into consideration. "In the beginning," recalled Jamie Courtier, "we took Dino quite a bit away from the original cartoon where he was a rather long-necked, big-butted character. Because there was going to be an animatronic head at the end of the suit neck, we made the neck shorter so we could control the head better – we didn't want the head bouncing around like a lollipop on the end of a stick. The first design also had longer legs than the cartoon Dino, to accommodate the human legs of the performer inside the suit."

Built by Alex Harwood, Carole de Jongh and Day Murch, the suit was eventually made up of foam rubber lined with nylon ribbing. "It was constructed kind of like overalls," Chris Barton explained. "Dave Forman, the suit performer, would step into it – his legs going into the back legs of the suit – then hoist the rest of the suit onto his shoulders using internal backstraps. Next, the front legs – with leg extensions inside – would be put onto his arms, and the whole thing would be zipped up. The last step was putting the animatronic head on top, which actually rested above Dave's head. When standing on his back legs, Dino was about eight or nine feet tall."

Positioned atop an eighteen-inch-long neck, the animatronic head required a special support system to keep it on a relatively even keel throughout the performer's actions. "The head was supported by a parallelogram system with springs, very much like a Steadicam system," said Barton. "The head would remain relatively steady and level as the body moved around, and not look as if it was being shaken on the end of this neck." Twenty servos were installed to actuate the animatronic head. "In addition, there were various large electric motors for actually moving the head around on the top of the neck, looking up and down or left and right. The whole assembly plugged into a socket that sat right behind Dave's own shoulder blade, so the head could be inserted and removed very quickly and easily." Operation of the head varied according to the demands of a particular shot. "For shots where Dino had to be freestanding – where you would see the total body in frame – we operated the head by radio control. For tighter shots we could control the head with a direct servo control lead. That was usually preferable because we didn't have to contend with radio

interference. All the servos and the head mechanisms connected up to the Henson Performance computer.”

Altogether, three Dino heads were constructed: the animatronic version that worked in conjunction with the Dino suit; a stunt version, also used with the suit, for shots that did not require much head articulation; and a servo-operated hand-puppet version that was employed for closeups. “The closeup head was the most versatile of the Dino heads. Each eye had independent up and down, and there were four servos dedicated to the brows. It also had three little quills that were controlled independently. It had mouth open and close, a smiling function, and articulated nostrils and tongue. The computer could coordinate all the movements so we could get some very complex expressions out of the head. We found that it was difficult to get much subtlety or nuance in the animatronic head that was connected to the suit – but with a hand-puppet, we could get a lot of attitude into it.”



Dino, the Flintstones' prehistoric pet prepares to steal Pebbles' breakfast. Like the brontocrane, Dino was both a mechanical and digital creation. Henson supplied an animatronic head for closeups while ILM provided full-figure computer generated shots.



A running gag in the TV show was Dino's rambunctious greeting of Fred. While nearly all of Dino's welcoming actions – which included chasing Fred, knocking him down and licking his face enthusiastically – were performed by the full digital figure, closeups were achieved with the animatronic head. The head was operated via the Henson Performance Control System – a computerized system that enables a single puppeteer to create a wide range of expressions and movements through joystick manipulation.

Despite the solid design and execution of the Dino suit by the Creature Shop team, the production company was only two weeks into the shoot when it became obvious to everyone that the man-in-a-suit approach was not going to suffice. “It was a bit disappointing,” Barton admitted. “Dave Forman was very good in the suit, and really got a lot out of it – more than we had anticipated, in fact. But there were things he physically could not do – he couldn’t jump into the air and do a somersault, for example – so it was more a matter of the limitations of the human body than the limitations of the puppet.”

“The kinds of frenetic, cartoon actions Dino had to perform were just too much to ask of a performer in a suit,” Colin Wilson confirmed, “so we talked to ILM about the possibility of doing full-body shots of Dino as a CG character – still relying on a Henson puppet head for closeups. It just seemed to everyone that CG would be the best way to go.” The shift towards computer graphics after the start of production

came as no big surprise to Mark Dippé – especially after his experience on *Jurassic Park* where the CG assignment had expanded to compensate for the inherent limitations of animatronics. “The Henson people did a great job,” Dippé commented. “They do what they do as well as anyone in the world. But anytime you use a full-scale, animatronic puppet approach, there is going to be just so much you can get with it. With CG, we could have a Dino that moved like a dog, or a Dino that jumped ten feet into the air, or anything we wanted.”

By taking on Dino – and ultimately, Kitty, the Flintstones’ sabertooth tiger pet – ILM’s Flintstones tasking jumped from fewer than a dozen shots to forty-three computer generated character shots, plus thirty digital rod removals, making it virtually as large and ambitious a digital project as *Jurassic Park*. “Our workload tripled in size,” noted effects producer Judith Weaver, “so we had to immediately bring on additional staff. Originally we had three animators and four technical directors working on *The Flintstones*; but we had to double our staff to accommodate the additional shots, and also extend our schedule from an October deadline to a February 14 deadline. When we were in the heat of the project, we had twenty to thirty people working on it – and even more when we had our rod and wire removals going.”

With the decision to scrap the Dino suit and go with computer graphics, the Henson Creature Shop redesigned the character – this time without regard for the limitations of human anatomy. “We produced a new maquette that was more faithful to the original cartoon,” Courtier said. “Since the second Dino was free of physical constraints, we could design something that was much more cartoon-like. It was still an interpretation of the cartoon, rather than an exact likeness, because it had to conform to the style we’d established with all the other creatures; but it was definitely much closer to the original.” Had the timing been better, the Creature Shop would have relished the



Crew members ready the Dino paws used for insert closeups.

opportunity to compete for the computer graphics assignment itself, as it was already engaged in developing a state-of-the-art digital facility in London. Unfortunately, however, it could not be rendered operational in time to be considered for *The Flintstones*.

Having redesigned and resculpted the Dino character, the Henson team sent a revised maquette to ILM that was used as the basis for their computer generated Dino model. They also proceeded to build a corresponding closeup puppet head that would be used in approximately twelve scenes shot during the last few weeks of production.

At ILM, Dino continued to be refined. "In the beginning," recalled Dippé, "there were unknowns regarding the Dino design, but he was similar enough to our Jurassic dinosaurs – in that he had a wrinkly, hidelike skin and was a four-limbed animal – that I didn't have any anxiety about whether or not we could pull it off. The main challenge with Dino was just capturing the essence of the character. So, working with Jamie Courtier and TyRuben Ellingson, we eventually came up with a Dino that had shorter, more doglike legs, a rounder teardrop body, a longer neck, and a tail and quills that were more dynamic."

"The thing that was really important about Dino," CG supervisor Alex Seiden elaborated, "was that he be cute. Dino is one of the most lovable characters from *The Flintstones*; everybody remembers him fondly. So he had to have a lot of appeal. Our task was to breathe life into this character and to make him that lovable lunk of a cartoon dog – but still work within the context of a live-action film."

As always, the first step in creating the CG character was building a model in the computer. "Eric Armstrong modeled Dino," Alex Seiden said, "and he did a really great job of capturing that particular 'Dino' look that we all remember from the cartoon. We started by taking photographs of the Henson maquette from a number of different angles, then scanning them into the computer and tracing the outlines of the character in order to digitize the shape. That gave us a basic outline, a starting point. From there it was a matter of setting up a series of patch-meshes. The modeling tended to be somewhat freehand." Because of the prominence of the character and the required detail, the modeling took several weeks to complete. "Obviously, we were going to be getting in very close on Dino, so we spent a lot of time modeling him. We also needed to make special versions of Dino for specific shots. For example, there was a shot where Dino was running out of the bedroom, and we found that his legs looked too stubby. We had modeled him according to the maquette, and from the side he looked pretty good; but running straight at you, he looked just like a little pot-bellied pig. So we made his legs a bit longer for that shot, and he looked much better. Those are the kinds of cheats you have to make all the time – and being able to do that is one of the great things about computer graphics. If you have a physical model or a suit, you're pretty much stuck with what you have. But with computer graphics, you can go back to the modeling stage and adjust things as needed."

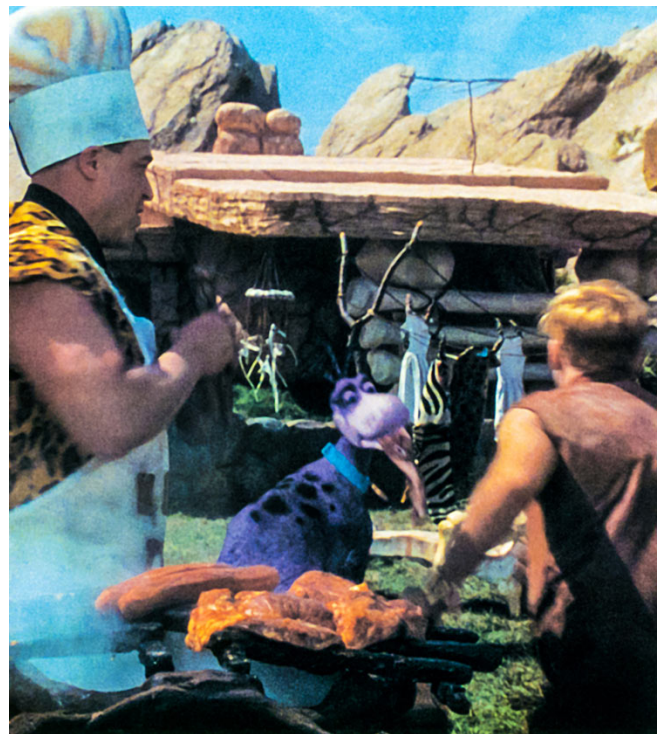
The next step in producing the computer model was painting the character by using Parallax computer paint programs. “Carolyn Rendu was our painter and she did a really great job. The painting was critical because the colors and the bump texture details were really important to giving this model the right character and the right sense of skin and scale and realism. So the modeling process gives us the creature’s shape, and the painting puts in the color and texture and details.”

“On *The Flintstones*,” related Rendu, “we continued a lot of the same working methods we had developed for *Jurassic Park*. One was hand-painting the texture maps for the dinosaurs. It’s as if you went to the model shop and they made a model and then handed it off to someone who was going to paint it. The difference here is that the model is made in virtual space and I paint it in virtual space on my computer.” The painting process incorporated both coloration and texture. “Dino is purple with black spots. So I painted that coloration, and that was one package of information. Then I went in and painted the bump map. I sculpted his scales and his finer wrinkles – everything that hadn’t been built into the model originally.” Although Rendu was tied to the approved maquette, some creative leeway was needed to translate the character from small scale to full size. “Because our Dino was going to be much larger than the maquette, I had to put a lot more detail into him. For example, the belly on the maquette wasn’t finished at all. So we decided that our Dino should have a slightly wrinkled belly. I also gave him a somewhat lighter color there, just as you would see on a real animal.”

As Rendu continued to finalize the model, Dippé, Seiden and animators Armstrong and Straus concerned themselves with the animation of the character. To prepare for the dinosaur assignment in *Jurassic Park*, the ILM animators had judiciously studied real animals. Finding real-life reference for Dino’s frenetic, cartoonlike movement was not as easily done. “Mostly we looked at dog footage,” Dippé



A digital Dino was inserted into the conga line at a bash celebrating Fred’s promotion to vice president of the Slate & Company quarry. Jean Vander Pyl – the original voice of Wilma in the animated program – was tasked with miming the action of holding onto Dino during the live-action shoot.



In a barbecue scene in the *Flintstones*’ backyard, Dino steals a brontosaurus steak from the grill. To suggest interplay between the digital and live-action worlds,

said. "Brian Levant had told us that his neighbor's poodle had the perfect 'Dino' movements; so he videotaped the poodle and we used that as reference, too. Dino's movements were basically doglike – and yet pushed beyond what a real dog could do. We took dog actions and then exaggerated them so that they were more stylized. We were able to make Dino do things that were not 'real,' yet really fit in with the style of the movie." Seventeen hyperactive, computer generated Dino shots were required, including opening sequence shots of his running to the car to go to the drive-in and his head later popping through the roof. Others included Dino's greeting of Fred, Dino in a conga line, Dino stealing a steak from a barbecue grill, and a series of shots for the end sequence in which the characters return home from the drive-in movie and reenter the Flintstone house.

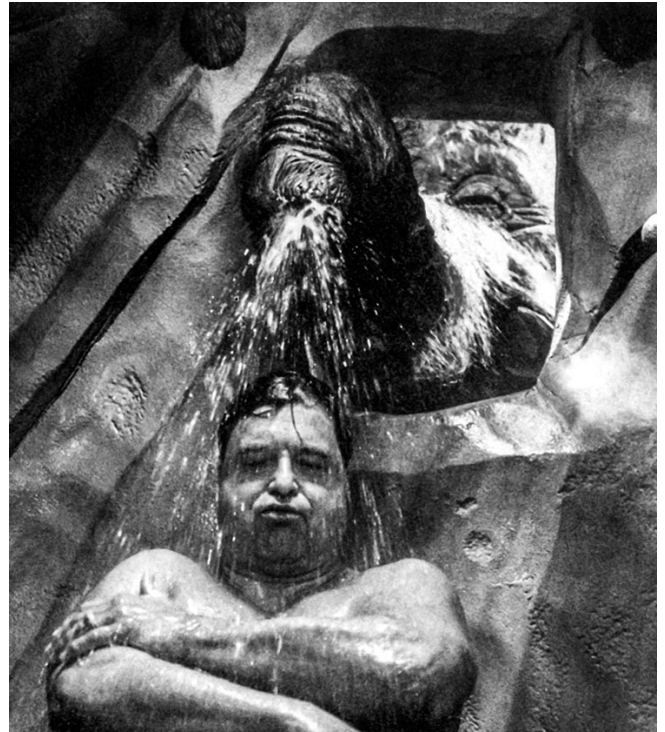
monofilament was used to yank the steak from the grill. For subsequent shots of Dino running away, the real steak was replaced with a digital replica. A suit was worn by a performer as reference during plate photography.



Since it was always poking through a window, only the head and front half of the mastodon needed to be built. Completed, it stood approximately ten feet tall and was equipped with servos to control facial movements. Gross articulation of the ears and head was achieved hands-on by performers hidden inside the massive body.

Using Softimage software, ILM executed the animation with the character in wire-frame form. "We do almost all of our animation using Softimage programs," noted Seiden. "They were the same programs we had used for *Jurassic Park*, and we used a lot of the same animation techniques we had developed for that movie as well. The animators sit in front of their workstations, looking at the scene in wire-frame composited over the top of our background plates. Then, by using the mouse, they can move the hands, feet and head of the character independently as they go through the scene."

To aid in the animation process, the live-action sets were also modeled – in rough form – within the computer. "We don't model the sets in very great detail because it's not necessary. But we do model them enough to give our animators a good guideline. These set models also provide 3-D shadow objects which help us create the right kinds of lights and shadows on our CG characters. For example, in the background plate of the Flintstones driving out of the drive-in movie theater there was a big archway which cast a shadow over the car as it drove underneath. You could see the shadow fall over Wilma and Fred; so to make it look right, the same shadow had to fall over Dino and Kitty sitting in the back seat. So we built a model in the computer that matched the archway of the drive-in and made sure that our CG light knew to use that archway as a shadow object. That way the same shadow would fall over our CG characters as over our real characters. In some cases it's easier just to eyeball it and paint in a shadow; but other times the best way to get the proper timing and feeling of a shadow is to actually model an object in. And, of course, not only are the shadows cast on the CG characters by the real environment very important, the shadows that the characters themselves cast onto the environment are important. When Dino is running across the floor, if he's not casting a shadow, it's going to look fake. So we spend a lot of time



The mastodon treats Fred to a shower. The highly flexible trunk was operated by cable, with internal plumbing and water supplied by Michael Lantieri.



Fred attempts to retrieve a fork from the throat of the pigasaurus garbage disposal. The pigasaurus was built by the Creature Shop as an animatronic hand puppet. Positioned under the sink with his arm inside the character, lead puppeteer Anthony Asbury provided gross body movements, while the animatronic eyes and brows

trying to get realistic-looking shadows playing on the set.”

were controlled by a second puppeteer stationed at the Henson computer.

The Dino model was finally rendered by way of RenderMan software. “Rendering, in and of itself, is just a process of taking your computer graphics database – that up to now, has been in wire-frame – and adding shading, color, texture maps, bump maps, all the things that make it look real. The most difficult part of rendering is making the model look as if it fits into the background plate. It takes a lot of artistry and craftsmanship to know how to light something and what cues are important and things like that. Matching the lights on the set is a start; but usually we don’t do one-for-one light matches because CG lights still work differently than real set lights. Also, it would be very difficult to match every single instrument and flag and reflector board and gel that was on the set, especially since all of that tends to change from take to take. So mostly we just light our CG model according to what looks right.”

Once animated and rendered, Dino was composited digitally into the background plates.

“Compositing is tied very closely with rendering, at least in an aesthetic sense,” stated Seiden. “We usually have elements, such as smoke or dust or shadows, that we also want to combine into the plate to make it look real. All of our compositing is script-based. We work with a system of commands that are tied together. So basically we’re going in and we’re editing little programs that will do a bunch of different compositing tasks and then output the final result. After the technical director has worked out what the steps are and has tested them and made certain he is happy with them, he can plug them in so that his overnight run will have all the compositing done to it. So in the morning, rather than just seeing a computer graphics element, we see a whole take composited together.”

To insure compatibility, the ILM crew was also involved in shooting the background plates into which their computer generated elements would be composited. Dippé and Weaver flew to Los Angeles on numerous occasions throughout principal photography to oversee the plate shooting. “We shot our plates very quickly,” Weaver recalled. “We took our measurements while the main unit was setting shots up, so we never held up the crew. When Brian was ready to go, we were ready to go. Mark and I would meet and talk about each of the shots to determine what kind of reference we would need. Then I would talk to Marty Ewing, who was the assistant director, and he and I would set it up so that first unit could keep going and we wouldn’t hold them up. It was very collaborative.”

Although the Dino suit had been scrapped, it provided valuable reference information for the CG team when it came time to shoot background plates. “It was wonderful to have it for camera composition, actor timing and pacing,” noted Dippé. “Usually in shooting our plates, it’s a case of the cameraman having to follow a character around – but he has nothing to look at. So how does he know where to go, or how fast to go there? This time, we had the guy in the suit to help us time things out. Same idea with adjusting lights – how do you light a character that isn’t there? By lighting the suit, all the lighting and shadows on the set made sense. So the Henson suit was very useful. It would be great to always have something like that as a guide in doing CG characters – but typically it’s too costly to do just as reference for us. In most cases, we have to make do with something like a wooden stick with a purple basketball on top that we move around by hand.”

Michael Lantieri was also on hand for the filming of the plates, primarily to provide interactive gags that would prove invaluable in making the CG character an integral part of each scene. “With all the Dino stuff, in particular,” Dippé recalled, “we worked very closely with Michael. Since we were shooting photography that had no creature in it, he had to make the set behave as if the animal was there. That’s a really critical element in CG work. We would say, ‘We want Dino to jump up and hit that little couch’ or ‘When he runs through the doggy door we want the door to pop open and then hit his tail one last time,’ and Mike and his guys would figure out how to rig the set so we could get the actions we wanted.”



The full-size mastodon clay sculpture in progress.



Molds are prepared from the completed sculpture.



Skins for the creatures were cast out of either silicone or foam latex. Crew members attach fur to the mastodon skin.

“Any little bits of interaction on the set were very helpful in selling the shots,” Judith Weaver affirmed. “At first, Brian was a bit reticent about putting those kinds of gags in – I think just because we hadn’t worked together before and he hadn’t done this kind of effects movie. It requires a whole different way of thinking about things. Luckily for Brian – and all of us – we are far less rigid now than when we were doing T2. Back then, everything had to be measured down to the millimeter and we needed massive amounts of information to lock the CG character into the plate. But as we’ve developed our tools, we have become much more flexible, which allows the director to be more creative in his camera moves.”



Both an overweight grotesque pigasaurus and a slimmer, streamlined version were sculpted and built, the latter for a scene in which the upwardly mobile Flintstones upgrade their home and appliances.

One of the interactive gags involved making the rug beneath Dino move as the animal jumped up to greet Fred. “The rug beneath Dino was supposed to curl up under him as he began to run,” Lantieri stated. “So, using cables, we bunched up the rug, timing it to what we estimated would be the action of Dino’s legs. Since we didn’t know what the final timing of the CG Dino would be, we used the Henson man in the suit for reference. We had him get on the rug and perform the action so we could see where his feet hit and how the rug moved. I also waxed the floor underneath really well so the rug would slide even more.” Another scene required that Dino’s doggy door be manipulated to look as if the character were passing through it. “It had to look as if his nose hit it first. Then it had to fly up all the way. It took a bit of thought and practice to get it to look right. In all these things, we would play with the timing and shoot several takes so that ILM would have a variety to choose from. That early on, even they were not entirely sure how the character was going to move and act, so we were all learning, and to some extent guessing as we went.” On-set interactivity was also needed for a scene in which Dino steals a steak from the Flintstone barbecue – an effect that was achieved simply by attaching monofilament to the giant piece of meat and yanking it off the grill. For subsequent shots of Dino with the meat in his mouth, a CG steak was modeled.



Whimsical Stone Age characters in various stages of completion occupy the Creature Shop in London. Founded by Muppet creator Jim Henson, the facility – now with a branch in Los Angeles – has produced performance-driven characters for television and motion pictures for more than thirteen years.

In one case, an interactive gag was put into a plate that had already been shot – without benefit of Lantieri’s machinations. “In post,” explained Weaver, “we split one of the rugs out and moved it a bit so it would look as if Dino was running over it. We just cut the rug out, split it out from the plate, and created a move on the rug, then recomposited it back into the plate.”

In a later sequence – in which Fred’s friends and family gather for a celebratory bash on the occasion of his job promotion – the CG Dino is seen dancing in a conga line with live-action

characters. “That was a tough shot for many reasons,” Dippé recalled. “It was a big dance number, and we had to get it in one take – so there was a lot of pressure. Jean Vander Pyl, the original voice of Wilma, was the one holding onto Dino, and she did a wonderful job. She had to pretend to hold onto an animal that wasn’t there, which can be very difficult. We had somebody pretend he was Dino and practice with her until she felt comfortable doing it without a body there.”



The most accomplished of the Henson creations was the wise-cracking Dictabird which serves as Fred's office dictating machine. Unlike the other creatures – which had few or no lines of dialogue – the Dictabird had a major speaking role in the film. Animatronics in the head were controlled by the Henson Performance Control System, allowing the puppeteer to either perform lines as scripted or ad lib dialogue with the actors on set.



On the fast track, Fred and Wilma buy a sporty Le Sabertooth 5000. Lantieri equipped the car – one of twenty made for the film – with a suspension system and an upgraded motor.

Another CG character – featured in seven shots in the movie – was Kitty, the Flintstones’ sabertooth tiger. Like Dino, Kitty had been conceived as a man in a suit, but had suffered from the physical limitations of that approach. A mere week after assuming the additional Dino shots, ILM was approached about taking on Kitty – a daunting task, not because of the number of shots, but because of the fact that, to date, no one had succeeded in creating a fur-covered CG character. “The production hadn’t been too worried about Kitty,” Dippé recalled, “since he was in so few shots. I remember asking them, ‘You had trouble with Dino – are you sure Kitty is going to be okay?’ And they said, ‘Oh, yeah, Kitty’s no problem – all he has to do is walk out of the house and walk back in.’ But later they were shooting a scene where Fred throws Kitty out of the house and then Kitty has to leap back through the window. And, sure enough, they started having problems. Colin Wilson came up to me on the set and said: ‘What if Kitty doesn’t work? Could you guys do it?’ And I really didn’t know because nobody had ever done computer generated fur for an entire animal in a feature film.” As the long night shoot wore on, it became increasingly obvious that the man-in-a-suit Kitty was not going to be able to perform the necessary actions. “It was about one o’clock in the morning, and Colin finally turned to me and said, ‘Mark, this ain’t gonna work.’ And I was thinking: ‘Okay, can we do Kitty? Can we do CG fur?’ Literally in five minutes we had to make a decision. So, on the spot, we took the risk and committed to it. It was a scary moment – but also an opportunity to do something new and groundbreaking.”

“It was a really ambitious step for us,” Judith Weaver elaborated, “and the pressure was really on, because from the time we said we could do Kitty, they abandoned any ‘Plan B.’ So we had to come through. We shot the plates while we were down there – both medium shots and long shots, just in case – and then came back to ILM and broke the news that we were going to do fur. We had faith that if anyone could do it, these guys could – but it was still a very scary thing. I was thinking: ‘What have I done? Can I still get a job at Wendy’s?’”



For a majority of the Dictabird's scenes, the puppet was stationed on a perch inside Fred's office. The office set was raised off the floor to accommodate the team of up to five puppeteers required to operate the character.

While other members of the CG team concentrated solely on the problem of creating fur, Geoff Campbell modeled the basic Kitty – sans fur – in the computer. “At first I worked directly from the Henson maquette,” Campbell explained. “I took photographs of it and scanned those in and built up the model from there. That maquette, of course, had been designed for a man in a suit. After a while, we got some books on cats and cat anatomy, and I looked at those and attempted to make Kitty look more like a cat, taking it farther and farther from the look of the maquette. All the Kitty shots were going to be CG, so it was not as if we had to worry about matching our Kitty to the Henson Kitty. Eventually we just went our own way.”

Because the ‘fur team’ urgently needed a character to work with, Campbell finished the modeling as quickly as possible. “Initially I had five weeks scheduled for modeling Kitty; and somewhere around the third week or so we were already trying to see how he was going to look with fur on. I had designed the first model somewhat thin, as a cat would look without its fur, and we wound up going back and forth with that as we got the fur on and saw how it looked. Ultimately, we wound up with a really anorexic model of Kitty, to the point where certain parts of the anatomy were a lot thinner than a real cat stripped of its fur would be. It was pretty funny, because it looked like a really pathetic thing without its fur.”

By far the greatest investment in Kitty came in the development of software that would result in believable, dynamic looking fur. While artist Carolyn Rendu and technical director Joe Letteri grappled with the aesthetic considerations such as fur color, texture, length and how it would respond to light, software engineers Eric Enderton and Dan Goldman attempted to develop fur software. Enderton and Goldman first went back through the literature to see what progress, if any, other CG artists had made in generating fur. “We found a paper by Professor Kajiya in SIGGRAPH,” Enderton said. “He had produced one frame of a teddy bear, and it was estimated at one billion instructions. So it took many hours of computer time to do one frame. Of course, he was a researcher, not a moviemaker; but that demonstrated how hard this problem was.”

“What we had to do,” elaborated Letteri, “was find a way to put fur on the surface of the model and say, ‘Around the face we want it to be kind of short and it has to lay close to the nose; and along the back of the neck we want the fur to move in this direction; and over the shoulders it has to break and go downwards; and longer here and shorter there, et cetera.’ Just trying to give ourselves the controls to duplicate all that turned out to be a pretty interesting project. On the dinosaur skins in Jurassic, we were able to do texture maps to make that happen, because it was still more or less a flat surface. But with fur, you have it sticking out all over the place – it’s three-dimensional. Essentially, we were dealing with thousands of individual, three-dimensional hairs. So we came up with a way to grow the fur on the skin using all these different controls to make it look the way we wanted. It was all proprietary software that we integrated with our production setup.” A preliminary version of fur software was completed in approximately two months. “Then we did a second version that had more interactive controls on it,” Enderton explained, “so the user could specify and vary things, like the length and the color over the surface of the cat, with as much control as possible.”

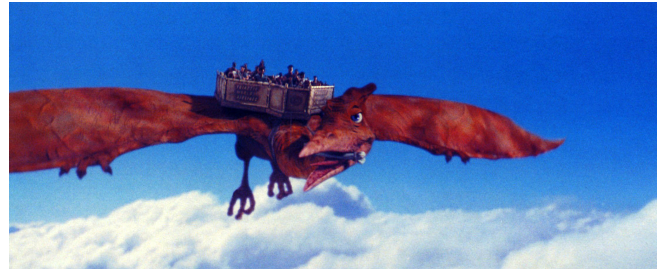
“At first the fur looked really mangy,” said Goldman. “Then it started to look better, but still kind of feral – as if no one had combed it in fifty years. At one point it looked as if it had just come out of a

bath. So it was a struggle to get it to look right. It took a lot of time to get a look, test it, change it, then test it again to see if we had improved it or just made it worse.” As finally developed, ‘Fur’ was more than a single software program. “It was a combination of modeling, animation and rendering; and it was integrated into some of the software that we already had. So it was not a single program unto itself, but rather a combination of techniques that were fed into various programs that we use. One piece of it was attached to this program; another piece was attached to that program.”

Fashioning a furry Kitty was more than a straight technical endeavor. “Even though it was primarily technical,” observed Rendu, “there were a lot of artistic considerations: the direction of the hair, the length of the hair, the density, how gravity affected it. It wasn’t just the same all over. You can, up to a point, determine those kinds of things in the computer; but the computer is only going to realize things in a gross kind of way, rather than subtly. So I would go in with my painting and essentially paint the information in a gray scale. If I painted a medium gray, it would affect at zero level; if I painted a lighter gray, it would affect it more; a darker gray, and it would affect it less. So I would paint the cat in gray to help establish things like hair length. Then I would paint him again and again until there were many layers of information – and the computer would lay each one on top of the other.” In color, Kitty resembled a ginger tabby. “At first we went for a more tiger-like look; but since no one has ever really seen a sabertooth tiger, the coloring was open for interpretation. We wanted to get into that Henson world, and the ginger color seemed to work best.”

The final step in the evolution of the fur was determining lighting that would show the animal off to his best advantage. “We spent a lot of time lighting Kitty to fit him into his scenes,” noted Joe Letteri. “And that was another interesting challenge because we had never had a chance to light hair before. We got to play with all the little tricks that they use on the set – backlighting and rim lighting and all that kind of stuff – to show off the hair.” Because the fur process was expensive and time-consuming, all of Kitty’s animation was accomplished with a fur-less model. “Then, after it was animated, we did the fur, the lighting and all the adjustments.”

Having broken the fur barrier, the ILM digital team foresees many opportunities to apply the new technology in future endeavors. “We’re already using the software on upcoming projects,” revealed Enderton, “and just because of the way these things go, we’ll probably be asked to use it in every show we do from now on. The technique still has a way to go, and there’s a lot of refinement we still



For an aerial approach to Bedrock in the early moments of the film, ILM modeled and animated a pterodactyl airliner. Stone Age passengers aboard a gimbaled cabin set piece were photographed against a bluescreen, with the resulting footage then match-moved to the computer generated character.



The lengthy approach also included shots of colorful Loch Ness-type monsters – designed by ILM art director Ty Ruben Ellingson – frolicking in a lake. For background plate material Mark Dippé shot footage of Lake Powell from a helicopter. Computer animated wakes helped place the creatures convincingly within the live-action lake.

want to do – such as making it faster, since it still takes a fair amount of computer time. The next challenge will probably be an animal with longer fur, or fur that behaves differently.”

The Flintstones’ domestic scene also includes Flintstone-style household appliances such as the pigasaurus garbage disposal, the mastodon shower/faucet and the rodent razor – all articulated Creature Shop creations.

The pigasaurus – a grotesque looking animal redeemed by a comical personality – was featured in an early scene in which Wilma complains to Fred that the garbage disposal is acting up again. Fred investigates and quickly discovers that the gluttonous pigasaurus has swallowed a fork. The porcine creature was built for the film by Gary Pollard and Malcolm Evans. “It was an animatronic hand puppet, packed with servos,” Chris Barton explained. “The whole body sat under the sink, and our lead puppeteer, Anthony Asbury, would do a gross body movement by just moving the head around. He would move the head and the jaw like a hand puppet, while the animatronic eyes and brows were controlled via computer by another puppeteer. The puppet had a hollow throat so John Goodman could reach his hand in to pull out the fork. We also built a newer model pigasaurus – for scenes when the Flintstones have become rich – which was basically the same as the old model, except it looked sleeker and cleaner.”

One of the creatures taken directly from the cartoon show was the bored, long-suffering mastodon that serves the Flintstones as shower and kitchen sink faucet. “The mastodon was beautiful – a real charmer,” observed John Stephenson. “We only built the front half of him – from his head to about the middle of his back – since you only saw him with his head sticking through a window. From the floor to the top of his head, he was about ten or eleven feet tall.”

“The mastodon was half-cable, half-servo,” Barton elaborated. “Its eyes and its facial movements were servo controlled through the computer, while its ears and gross head movement were done hands-on by performers inside the body. The trunk was cable operated and incredibly flexible. At one point we had it massaging Fred’s hair. In the kitchen, the trunk would bend into an ‘S’ shape, like a faucet, to squirt water into the sink. The mastodon needed about four puppeteers altogether. The whole thing was mounted on a dolly so we could wheel it around to whatever window it needed to be in.” The special effects crew provided the mastodon’s water supply, rigging plumbing within its trunk.

Chris Fitzgerald and Chris House were responsible for constructing the little rodent razor. “It had eye movement and a kind of chattering mechanism in the jaw so that it would seem to gnaw the whiskers off Fred’s face,” Barton explained. “There was a servo for the tail, as well. The razor was very much a self-contained unit, and could be switched on and off by a remote control transmitter.”

With the Flintstones’ home life established, the story jumps to the Slate & Company quarry where Fred and his fellow workers are engaged in the taking of an aptitude test that will determine which of them will be promoted to vice president. Wide shots of the quarry, an exterior set constructed at the CalMat quarry, revealed two lumbering brontocranes at work. The full-body creatures featured in this and other establishing shots were rendered through digital means. “All the closeups of the bronto head are, of course, the Henson rig,” explained Dippé. “But all the wide shots were done with CG brontocranes. The wide shots are wonderful because they show these gigantic beasts moving really slowly, dropping rocks and picking them up. Those are some of my favorite shots in the

movie, and I think everybody wished we had done more. In fact, they used one of our shots twice. It worked so well that they just put it into another scene later in the movie.”



The opening concludes on a hilltop overlooking suburban Bedrock. The ILM effects team photographed a tabletop miniature, then added computer generated cars and live smoke elements. Modelmaker Barbara Affonso dresses the Bedrock miniature.



Ty Ellingson completes a painted backing for use with the Bedrock model.

Geoff Campbell modeled the brontocrane, working from the Henson maquette. “We also had the full-size rig to use as reference,” said Campbell, “and on one occasion we went to L.A. to measure the head and tail of the full-size rig. We took a lot of photographs because we knew we would have to match the rig for closeups. Matching was more important with the brontocrane than with some of the other characters, because they would be cutting from the CG version to the live-action version and vice versa. Even so, we didn’t do any digitizing. I just eye-balled it, and built up the model with spheres, then projected curves through that – it’s an Alias function that allows you to get your topology ready so you can skin it together uniformly.” Carolyn Rendu, Dave Carson and TyRuben Ellingson all worked on the painted texture maps that covered the slightly cartoonish, blue and brown animal.

Animator James Straus attempted to bring out the humor in the animal’s behavior and attitude. “I had to approach it from the point of view that it was an animal and that it was thinking,” Straus noted. “To get the gag to work, it had to look like a beast of burden that doesn’t really like its job.” Straus also built and animated a small spherical model of Fred which was incorporated into the long shots.

Closeups of John Goodman atop his brontocrane were usually achieved through use of the Henson mechanical rig; however, footage of the actor was also composited into computer generated shots. “They filmed John Goodman in a cab, working fake controls,” Straus explained. “The cab was rocking on a kind of hinge to suggest movement, and there was just a mock-up of the brontocrane below it. So we shot that and used articulated mattes to extract Fred from the plate and get rid of the bronto mockup.” To some extent, Straus’ animation of the CG brontocrane in such shots was inhibited by the movements of Goodman inside the practical cab. “Whatever Fred was doing on the hinged contraption, I had to make sense of it with the CG bronto’s movements – which really locked me in. I’d want the whole bronto moving and lifting these heavy rocks and showing all this transfer of weight, but I couldn’t do it because John Goodman’s part of the shot didn’t accommodate that kind of movement. In the end, it worked out all right and the shot looks really good. I also animated little rocks coming out of the brontocrane’s mouth, which was fun. I didn’t expect to be doing that level of detail.”

Unaware that his slightly more brainy friend Barney has switched aptitude tests with him, Fred is stunned to learn that he has won the promotion. From the blue collar environment of the quarry, Fred is elevated to the executive penthouse of the Slate headquarters where he enjoys a modern office complete with a Rockadex file, a RocIntosh computer and a Dictabird. Unlike the other Henson critters – which delivered one-liners in brief scenes – the Dictabird had a major speaking role and was a pivotal character in the story.



Late in postproduction, ILM was tasked with creating a wide shot to establish the Cavern on the Green nightclub. With only a few days to complete the shot, the effects team elected to reuse the Bedrock miniature, adding a model of a hill topped with Stonehenge rock formations. Since the shot was to be at night, street and building lights were also installed. Modelmaker Nelson Hall dresses the miniature.

Throughout most of the movie, the Dictabird was positioned on a perch inside Fred's office – a set that was raised off the floor to accommodate the puppeteers – but scenes near the end of the film required a wide range of movements with the bird interacting physically with the players and even flying about the quarry. To allow for that kind of flexibility, several different versions of the bird were constructed. "The Dictabird had to be adaptable," said Chris Barton. "At one point, it had to sit on Fred's shoulders; in other scenes, Wilma and Betty had to carry it. So we needed quite a few variations of that one bird, and the way we achieved that was by building modular pieces that we could mix and match."

Jez Harris and Richard Gregory built two identical animatronic heads, each highly complex and equipped with more than a dozen servos. "We built two, just to have a backup. They were quite small, yet they needed to have quite a bit of movement – eyes, beak, head left and right, all that sort of thing. So a lot of servos had to fit into a very small space. We also built a stunt head that could just turn left and right." Two bodies were constructed for the Dictabird. "The cabled bodies included mechanized necks and heads that could move in every plane. For scenes where the bird had to be carried around – which meant there couldn't be cables coming out of it – we built a radio control body that could accept either the animatronic head or the stunt head. There was also a pole arm version that had cable-controlled running legs. For that one, one puppeteer would support the body on a pole arm while another puppeteer operated a complete set of flapping wings. Yet another controlled the legs. And, of course, the animatronics in the head were controlled by Anthony Asbury on the Henson Performance Control System. The beauty of the control system, in this instance, was that it allowed Anthony the necessary freedom either to stick to the lines in the script or to ad lib much as a real actor would. The system could accommodate whatever was needed. So Anthony was right there, delivering lines that the other actors could respond to – even though they did not use his voice in the final soundtrack." The Henson team also built several sets of wings, a pair of dummy feet and a pair of animatronic feet. "For any given situation, a combination of these things could be put together to get the most out of the puppet for that particular shot. At its most complex, there were up to five people operating it at a time."

Interiors at the Slate headquarters also featured the elevator lizard – a four-foot-long creature that ran on a conveyor belt, supposedly providing the power for the elevator's ascent and descent. "The elevator lizard was quite a mechanism," Barton said. "It was built by Paul Knowles and it ran off one electric motor, with the drive supplied down a pole arm that supported the creature. The pole arm went through a wall on the off-camera side of the set; and as it revolved it turned the cams over, which made all the legs and the tail move." The actual lift for the elevator was provided mechanically by the physical effects crew. "We built a whole cage that was run by pulleys and cables," explained Michael Lantieri. "We also built the conveyor belts and the motors to drive the conveyor belts, and rigged the whole thing so that it would look as if the creature was powering it."



Though implicated in an embezzling scheme perpetrated by evil executive Cliff Vandercave and accomplice Miss Stone, Fred is ultimately vindicated by the all-hearing Dictabird.

Unknowingly being used as a patsy by Vandercave and Miss Stone, Fred is ordered to fire Barney as a test of his loyalty. That done, Fred is likewise coerced into signing hundreds of requisition forms for a modernization scam proposed by Vandercave. The modernization – which results in the firing of all the quarry workers – involves a new means of building prefabricated houses by slicing huge slabs of stone that can then be erected into housing structures.

The rock slicer was a massive, Rube Goldberg-style contraption equipped with prehistoric wheels, gears, whistles and conveyor belts. Built on location at the CalMat quarry, the rock slicer – in both full-size and model form – was primarily the responsibility of Michael Lantieri. “The rock slicer was a giant machine with all kinds of working hatchets that came down, supposedly slicing slabs of stone. Nancy Patton was the art director who was assigned to that particular project. It was such a big, nondescript thing in the beginning that to sit down and do working drawings of it was almost out of the question. So we just worked off an artist’s rendering of it, starting by building rough shapes. The rock slicer was probably about a hundred feet long, and it had conveyor belts that moved huge boulders on carts. The boulders were the size of cars – eight or nine feet in diameter – and they would be flown onto the conveyor belts from a catapult, then moved forward and sliced into slabs by these four huge tomahawks, each of which weighed about a thousand pounds.”

To simulate the actual rock slicing, the effects crew built boulders that would burst apart as the tomahawks hit. “We built them out of pyrocil, which is a real soft plaster that crumbles nicely. Everything was timed out so that these boulders would move through, the tomahawks would hit and the rocks would split. Then there was a machine to punch windows into the slabs. The whole thing was supposed to look as if it was steam-driven, but in actuality it was driven by pneumatics. We hid all the motors behind rocks, and cables were hidden within the bamboo and bonelike dressings. We used a lot of plaster and some fiberglass in the construction, and then dressed it with organic reeds and vines and things like that to hide our cables and motors.” Altogether, the physical effects and construction crews labored for two and a half months to complete the rock slicer, working in the dead of summer and in the treeless rock quarry where temperatures rose to as much as 120 degrees. “There was no breeze, no wind, and it



The climactic moments of the film featured the Dictabird in a number of action scenes at the quarry. When a plan to dig trenches at the location to conceal the puppeteers was judged too time-consuming and impractical, the production decided to shoot the Dictabird’s action with puppeteers and pole arm clearly visible and rely on ILM to remove them through digital image processing.



Among the most difficult rod removals ever executed at the facility, the Dictabird quarry scenes required laborious hand rotoscoping and the painstaking piecing together of frames to create clean plates.

was extremely hot. So the crew had a rough time. They didn't complain, but you could see that things were happening more slowly than they normally would – and we were really backed up against time and schedule with this thing. We were building it literally up until the day before we shot it.”

Lantieri and crew also built a fifth-scale version of the rock slicer for a scene in which Cliff Vandercave attempts to sell the Slate board of directors on the modernization proposal. “It was a table-size model, and we had to match its movements to the big machine. The model had little carts that drove through with miniature rocks on them, and we powered it by just having someone under the table with a magnet sliding along. We also incorporated little steam jets into the model so that it would really match the full-size one.”

As Barney takes one demeaning job after another and the Rubbles lose their home, the Flintstones are on the upwardly mobile fast track. Tensions between the two families mount as the Rubbles are forced to move in with the Flintstones – and finally culminate with Barney assaulting Fred at Cavern on the Green, the posh nightclub where Barney now works as a waiter and where the Flintstones have come to celebrate Wilma's birthday in style.

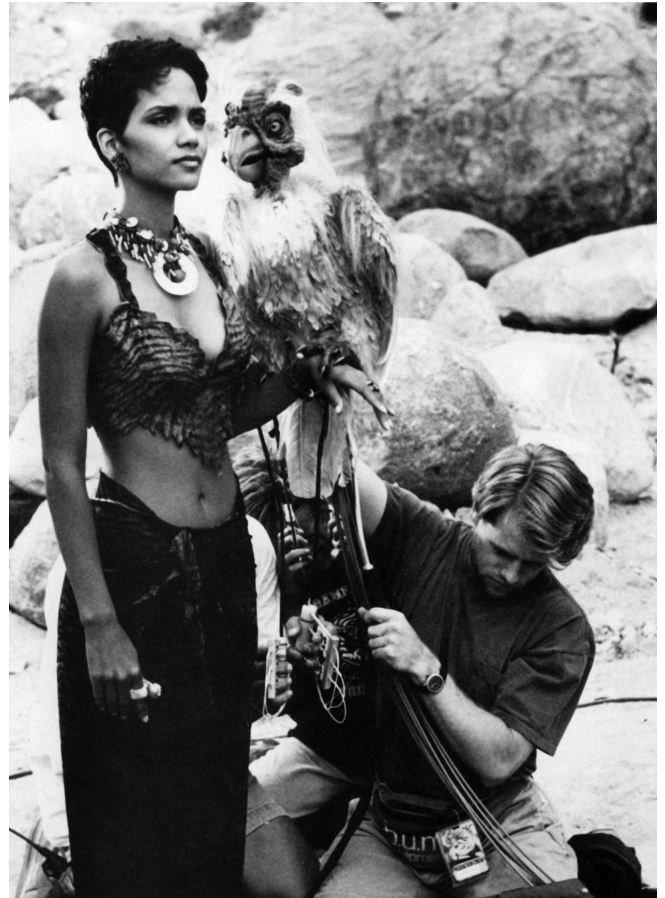
While Cavern on the Green was built as a full-size set on a Universal soundstage, the wide establishing shot of the nightclub – which featured the familiar stone formations of Stone-henge sitting atop a mountain plateau with Bedrock in the distance – was achieved as a miniature shot by ILM. “We got the Cavern on the Green shot relatively late,” Mark Dippé commented. “When the sequence was edited, it was realized that they needed a wide shot to establish that we were at Stone-henge – which was the whole gag. Then they could cut to people driving up to the full-scale set.”

Looking for a way to conserve on both time and money, the ILM team determined that an already existing model could be modified to suit the establishing shot. “We were getting to the end of our schedule and we didn't want to have to build a tremendous new set and spend a whole lot of money. So we took the Bedrock miniature we had built for the ‘Powers of 10’ shot, rearranged all the background pieces, and then just built a whole new foreground section – which was a hill with Stonehenge at the top. We also repainted the backing to give it a magic-hour look. It was painted to match the cyc they had had surrounding the full-scale set, although we took a few liberties with our backing since our shot was so much wider. We added a lot of lights to the model to suggest the city at twilight. We also built cars to drive up the mountain towards the nightclub. There was a hidden slot on the hill, and through the slot the cars were attached to a motion control rig. Motion control was necessary to get the repeatability we needed for multiple exposures on the lights. To achieve really beautiful lighting, we had to expose separately for just the lights themselves – the lights on the cars, the lights on the Cavern on the Green and the lights of the city.”

With Barbara Affonso and Brian Gernan supervising a model crew of five people, ILM completed the miniature construction and shoot in only eight days. “It was a phenomenal thing to complete in such a short time,” noted Judith Weaver, “because there was an amazing amount of alteration that had to take place on the original Bedrock model. That model had been designed for a specific camera angle and for a specific shot, so there was a lot we had to do to get it to fit for this shot. All the houses on the model had to be hollowed out so that we could put lights in them; and each of those lights had to be wired and placed individually. We had to design a lighting structure that we could put on the ground to light the midground and background levels of the miniature; and we had to design a light gag for the Stonehenge part of the model to suggest a feeling of motion and activity within the nightclub without actually having to put little people in there. The entire model was carved out of huge blocks of foam and then treated to look like stone surfaces. All the houses were hand-carved – we didn’t have a mold for that. So we were able to use what we had built, and keep the camera angles enough alike that the perspective would be okay.”

Finally fed up with Fred’s snobbish demeanor at the nightclub, Barney punches his old friend out – leaving a staggered Fred out cold with pterodactyls flying about his head in true cartoon fashion. The visual gag was conceived by Brian Levant late in the production schedule, but was easily accommodated by ILM since the pterodactyl had already been modeled in the computer for the movie’s opening sequence.

The friendship between the Rubbles and the Flintstones now sorely strained, the Rubbles move out of the Flintstone abode. Fred’s worries mount as the laid-off quarry workers turn on their ex-colleague, and Fred is implicated as an embezzler. Discredited and desperate, Fred dons a disguise and goes on the lam, but is eventually apprehended by an angry and vengeful lynch mob. Barney is soon strung up as well when he makes a misguided stop in his sno-cone truck – the latest in a string of going-nowhere occupations – to sell refreshments to the mob. Meanwhile, Wilma and Betty unite to steal the Dictabird – who alone can attest to Fred’s innocence – and arrive just in time to stop the mob and save their husbands. Mission accomplished, Betty and Wilma return home with Barney and Fred only to learn that Cliff Vandercave has kidnapped Pebbles and Bamm-Bamm and is holding them in exchange for the implicating Dictabird. The characters return to the Slate &



Puppeteers rehearse the Dictabird for a scene with Miss Stone (Halle Berry). Because the character was to be featured in a variety of situations, the Henson crew built the puppet as a highly adaptable, modular unit that included both animatronic and stunt heads, multiple cabled bodies, a radio-controlled body and a pole arm version with cable-controlled running legs. Different parts were mixed and matched depending on the demands of each shot.

Company quarry – where Vandercave has strapped the children to the deadly rock slicer machine – and execute a daring rescue.

The Dictabird's climactic scenes, particularly at the quarry, required numerous rod removals – and in some instances, puppeteer removals – realized by the ILM digital team. “We did about thirty rod removals altogether,” noted Mark Dippé, “and some of them were the most difficult that have ever been done at ILM. Many were quite painful, and took a lot of creative thinking and diligence, but they proved how valuable digital techniques can be to a production. When the first unit was on the set, there just wasn't enough time to rerig the puppet for every shot. Once they had a rig that was working, they obviously wanted to try and use it, no matter what angle they were dealing with. That meant that many of the rigs were visible; but the fact that they knew we could fix things digitally helped them to move along and get the shots they needed. They were able to proceed at full force, without having to worry about building special rigs for every single setup.”

One of the most difficult of the digital repairs was for a shot at the quarry which, as originally photographed, included Kyle MacLachlan, the Dictabird, plus three puppeteers operating the bird by means of a long pole arm. At one point early on, the production had considered digging trenches on location to conceal the puppeteers; but when that solution proved too troublesome and time consuming on set, it was decided to use the pole arm version of the Dictabird and rely on ILM to digitally remove both the mechanism and the puppeteers from the frame. “The puppeteers had to be right there in the shot,” explained Weaver, “so we didn't do just rod removals, we did puppeteer removals. There was a lot of handwork involved – putting in shadows and painting things back in – and our crew did an amazing job.”

The puppeteer and rod removal effort involved a number of painstaking processes. Areas in which the bird flew against one of the puppeteers required laborious rotoscoping, sometimes around flapping, ill-defined feathers. In addition, because no clean plate had been shot on the set, a suitable alternative that could be utilized to replace the large areas covered by the puppet operators had to be assembled in bits and pieces. “The problem was that we had to remove a lot of the plate, but we didn't have anything to put into the plate,” recalled rotoscope artist Sandy Houston. “In an ideal situation, we would have had a clean plate that we could use to replace areas in the unclean plate, and no one would have known the difference. But because we didn't have a clean plate, we had to piece one together and then add shadows and all the other things to make it look right. Doing that required painting and animation and rotoscoping. We rotoscope using traditional methods, except that we are working on computers; so instead of using pencils, we use a stylus or a mouse.”

In most removal procedures, the wire is eliminated by covering over the area to be deleted with images and textures drawn from the surrounding background. “In this situation, we had a whole human being – which was much bigger than a wire – and that was just too big an area to be filled in simply. We couldn't just smudge over from the side as we usually do. Instead we had to piece it together, searching for frames that had some of that area which was clean and then using that.” Another method was to split in an entire section of a clean plate. “The complication with that comes with shadows moving across, or changes in lighting. We just have to make sure everything is consistent – and sometimes that means animating a shadow so that it continues across the split, or adjusting the lighting so that the two plates match.”

“The puppeteer removal was really an example of how far we’ve come,” Weaver concluded. “Two years ago, our wire removal plates had to be locked, and the wires had to be straight and they had to be black. There were all these technical specifications that had to be met in order to do wire removals. Now we’re getting rid of moving puppeteers that took up most of the frame on plates that weren’t locked and weren’t even clean. Those rod removals in *The Flintstones* were as challenging as anything else we had to do on the film, and yet they were considered almost throwaway effects.”

At the quarry, Fred and Barney rescue Pebbles and Bamm-Bamm – who are inching closer to the rock-slicing tomahawks – by flying Barney through the air in a boulder catapult. The special effects team flew Rick Moranis’ double by cable, testing the stunt first with sandbags. For the beginning and ending shots, Moranis himself was strapped to the device and lifted by crane to suggest his takeoff and subsequent landing.

With Pebbles and Bamm-Bamm rescued, the Rubbles’ and Flintstones’ friendship restored, and Cliff Vandercave and Miss Stone apprehended, harmony returns once more to Bedrock. Just as the beginning of the movie replicated the cartoon opening, the film ends in a recreation of the animated show’s closing sequence: the Flintstones emerging from the drive-in theater and pulling into a drive-in restaurant where ribs are served so huge that they tip the car over on its side; the family arriving home and Fred appearing at the door to put out a bottle of milk and Kitty – who immediately turns around and jumps back into the house through the window; and the door closing, leaving Fred locked outside, pounding on the door and shouting, ‘Wilmaaaa!’

It took nearly thirty years, but *The Flintstones* finally made the big leap from animated television series to big-screen extravaganza. Five of those years were spent on the back burners at Amblin and Universal – and yet the result was worth the wait. “As it turned out,” Bruce Cohen noted, “it was really nice that the movie didn’t get made any earlier because, during that five-year delay, there were so many breakthroughs in digital effects. Quite literally, if *The Flintstones* had been made any earlier than this year – before *Jurassic Park* – we wouldn’t have had a Dino that was such a perfect combination of animation and live-action, and we wouldn’t have had our Kitty. So there were really benefits to having waited.”

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THE RISE AND FALL OF NORVILLE BARNES

image

article by
W.C. Odien

Life was simple in 1958. There was Captain Kangaroo, Cokes for a dime, and morning newspapers that actually landed on your front porch. Folks left their doors unlocked; and if you needed a cup of sugar, you could send little Billy next door to the Joneses to borrow one.

It was a time of hope and prosperity. An idea and a willingness to put in a hard day's work was all it took to achieve the American dream – which is why Norville Barnes (Tim Robbins), the nerdish and naive hero of *The Hudsucker Proxy* hopped on a Greyhound and left Muncie, Indiana, for the Big Apple. Landing in New York with a long-term goal – but a short-term need to eat – Norville strode across Madison Avenue and through the doors of the massive Hudsucker Building in search of a job. What he did not know was that Waring Hudsucker (Charles Durning), president and founder of Hudsucker Industries, had just jumped out of the forty-fifth floor boardroom window – forty-sixth, counting the mezzanine – and was about to merge with the sidewalk below.

The thud would change Norville's life forever.

Looking through the broken window far above the street level, devious Hudsucker executive Sidney J. Mussburger (Paul Newman) devises a plan to drive the price of Hudsucker stock into the basement by hiring an imbecile to take the place of the newly departed president. With stock prices at an all-time low, Mussburger and his fellow board directors intend to buy up all of the late Hudsucker's shares, thus gaining total control of the company. Norville, of course, is that imbecile.

Mussburger's plan goes awry, however, when Norville brings Hudsucker Industries its greatest success – the hula hoop. But after a meteoric rise to



In *The Hudsucker Proxy*, filmmakers Joel and Ethan Coen send up the corporate world with a comedic fable about a board of directors that schemes to depress stock prices by appointing a neophyte from the mail room, Norville Barnes (Tim Robbins), as president of Hudsucker Industries. The plan goes awry, however, when Norville's invention – the hula hoop – becomes the company's biggest success. A stylistic period piece far removed from standard effects fare, *The Hudsucker Proxy* nonetheless required complex miniatures, special effects rigs and digital composites. Assigned to supervise the work was Micheal J. McAlister.



The Coen brothers – with production designer Dennis Gassner – envisioned an art deco-style New York City, built entirely in miniature by Stetson Visual Services. The fantasy version of Manhattan was revealed in an extended opening shot in which the camera soars leisurely over the Hudson River, through a canyon of skyscrapers,

fame and fortune, Norville is betrayed and framed as a fake. It is just before midnight, New Year's Eve 1959, that he finds himself drunk, disgraced and contemplating a jump from the very ledge where Waring Hudsucker had taken the plunge not long before.

and finally to the forty-fifth floor of the Hudsucker Building.

The Hudsucker Proxy is the latest offering from Joel and Ethan Coen, the fraternal filmmakers responsible for such offbeat fare as *Raising Arizona* and *Barton Fink*. Although hardly a typical effects film, Hudsucker's unusual retro style required extensive miniatures, digital composites and some ingenious special effects rigs. Supervising the overall effort was visual effects artist Micheal J. McAlister. "What really appealed to me about this project," McAlister stated, "was that it was the funniest first ten pages I'd ever read. I love the Coen brothers' films – I've seen them all – and the opportunity to work with filmmakers of this caliber, who are real artists and real visionaries, comes up once in a lifetime. Working with them required a different approach to visual effects on my part, because when they came to me, they already had a vision of what they wanted. My challenge was to get the same vision they had, understand what they were talking about, and then try to enhance their vision wherever possible."

As conceived by the Coens, the essential aesthetic element of *The Hudsucker Proxy* was a highly stylized – virtually fictional – New York City. Brought on to fulfill the filmmakers' vision was production designer Dennis Gassner, who had collaborated with the brothers on *Miller's Crossing* and *Barton Fink*, earning an Academy Award nomination for his work on the latter. "Hudsucker was a very involved project," Gassner observed. "It was extremely ambitious, and it quickly became a big movie, production design-wise. The Coens' films have a sense of hyper-reality – I would say they are almost surreal – and my job was to find that tone."

The creation of that surreal environment was not only a major production design concern, but also a compelling element of the movie's effects assignment. "The effects needs for Hudsucker involved creating the illusion of a 1950s art deco New York skyline," McAlister stated. "Because the whole movie essentially took place in penthouse suites of an office building, certain cityscapes needed to be visible outside office windows. The interior sets were built on soundstages, but the Coens also needed a sweeping view of a fictional skyline. They couldn't go to New York and shoot translight screens of what is there now, because they didn't want modern buildings. They didn't want what was really there in the fifties, either, but rather a stylized version of what might have been there in the fifties. So it became obvious that the only way to get that specific look was to build and shoot a miniature city."

Enter Stetson Visual Services, the much-respected miniature effects company founded by Mark Stetson and Robert Spurlock. Spurlock, in particular, had a relationship with Gassner that dated back to their days as colleagues on the Zoetrope lot working on films such as *Rumble Fish* and *The Outsiders*. In addition, Spurlock had served as mechanical and fire effects supervisor for *Barton Fink*. It was during production of that film that the Coens approached Stetson Visual Services about their upcoming project. "They already knew they were going to do Hudsucker," Mark Stetson recalled, "and a couple of times they said to us, 'Boy, do we have a lot of work for you next time!' And, boy, did they."

The creation and execution of the imaginary art deco New York became such a formidable undertaking that Stetson and Spurlock decided to divide the job into three sections with a separate crew assigned to each. Chief modelmaker Ian Hunter supervised the building of thirteen miniatures that duplicated actual New York skyscrapers in twenty-fourth scale – miniatures that would be employed in an opening fly-through sequence and in two plot-pivotal falls. Crew chief Henry Gonzales supervised the construction of the twenty-fourth-scale Hudsucker Building that would be featured prominently throughout the production. And finally, crew chief Dana Yuricich was responsible for a sixth-scale clock section of the Hudsucker Building – a detailed miniature that would be used in closeups and in conjunction with live-action footage. In all, Stetson Visual Services had twenty to thirty people working full-time on the Hudsucker project at their studio in Los Angeles.

The movie opens with the camera drifting through a grand canyon of high-rises, finally coming to a stop at the forty-fifth floor of the Hudsucker Building. All the skyscrapers seen in the opening were constructed in twenty-fourth scale. The process began with photographs of buildings selected by Dennis Gassner from a book entitled *New York in the Forties*. “Dennis went through this book in advance and picked out the buildings they wanted us to duplicate in miniature,” Stetson said. “Each of the models is, in fact, a real building in New York – the Chanin Building, the French Building, the Bank of New York – but for the purposes of the movie, we rearranged them.”

With the book as reference, designer and modelmaker Chris Gorak rendered drawings of the chosen buildings in eighth-inch-to-the-foot scale. “The drawings were blueprints,” Stetson explained, “usually with two views and a plan view to show the shape of each floor. We then made mockups of each building to see if they scaled together properly. In some instances we had to fudge the building heights to get what we needed in the basic setup. Mike McAlister came over and did some tests with the mockups, flying the camera around buildings to see what he would need when he was actually shooting. Those tests answered a lot of his questions concerning building heights and camera angles. He specified some of the heights he wanted and we would translate those specifications into a mockup. A few rounds of back and forth like that, and we were pretty well set to begin construction.”

Multiplying the eighth-inch-to-the-foot scaled drawings by four to determine the size of the twenty-fourth-scale replicas, the modelmakers began constructing the miniature buildings. “The majority of the buildings were built of one-by-four wood frame,” Ian Hunter explained. “The actual building faces and columns were mostly built out of wood also. If the building had a large flat face to it, we would make the building frame and then fashion the flat surfaces out of a material called Sintra. Sintra is a really nice material – an expanded PVC that is more rigid than styrofoam, but not as hard as plexiglas. It cuts very easily and it has a very smooth surface so you can do any sort of detail work on it.”

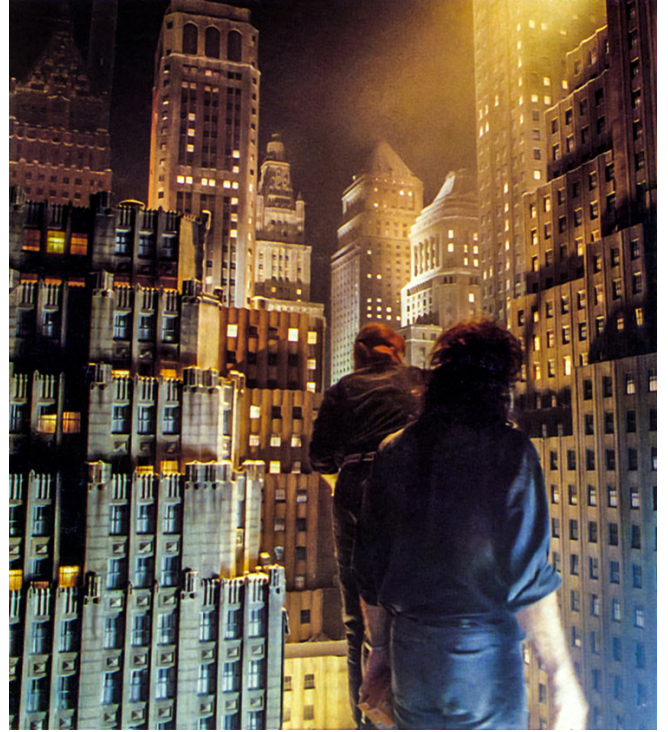
Because the camera angles determined by McAlister would not require four-sided buildings, most of the miniatures were built two-sided, with a front face and either a left or right side. In addition to the thirteen two-sided buildings, Stetson Visual Services fashioned approximately twenty one-sided buildings for background use. “They were merely wooden frames with luan faces that were cut out in strips and overlapped like a lattice to create window openings,” Hunter said. “Luan is a thin

imported plywood used for door skins. It's a nice material because it is stable and lightweight." For the most part, the background, one-sided buildings were revealed only in silhouette. "We had a black backing and a row of these flat facades that were backlit; so they were in silhouette, with the dimensional buildings in front of them."

Once the basic construction was completed, the buildings moved on to the detail crew which was responsible for adding cornices, windows and any aging characteristics. "Someone would build a pattern for, say, a cornice detail," said Hunter. "That pattern would be turned into a rubber mold; and that rubber mold would subsequently be sent to the casting department where they would cast up parts all day long. Finally, each of those parts would have to be attached to the buildings." Once such details were added, the miniatures – still minus windows – were painted by chief painter Ron Gress and painter Renee Rabache.



Real and imaginary skyscrapers were built in twenty-fourth scale by the Stetson model shop crew. Effects director of photography Pat Turner and chief modelmaker Ian Hunter install lighting on the as yet unpainted Hudsucker Building.



Framed in wood and faced with either wood or plastic, the high-rise miniatures required nearly fifteen thousand custom-made windows – many with interior dressing.



The completed Hudsucker Building on stage at the Carolco Studio in North Carolina. An enlarged sixth-scale section was built for closer views of the clock and its immediate surroundings.

In the paint department, the models were primed with latex paint in muted colors chosen by Gassner. Allegedly, the Coens had given some thought to shooting the movie in black-and-white, but changed their minds when executive producer Joel Silver threatened to colorize it after the fact. A compromise was reached with buildings that were almost monochromatic. “Dennis didn’t want to see any color at all,” Ron Gress recalled. “In fact, some of the original buildings had beautifully patinated copper roofs – and I completely grayed them out. We also ended up doing a lot of faux detail – like levels of stonework up and down the sides of buildings – which was all airbrushed in. Then everything was weathered with a light dusting of lacquer. Acetone was used to kind of melt the lacquer and give us a nice streak of soot and stuff like that.” For brickwork detail, the artists cut out brick stencils and sprayed paint over them onto the models. “In some cases, we actually used vacuform bricks. Each building had its own characteristic detailing.”

Each building also had a specific type of window installed in its facade. Russ Simpson – a longtime Stetson friend and owner of Simpson Products – cut tooling from Gorak’s plans and injection-molded an initial order of ten thousand windows. “Michelle Morgan, a person with a lot of stamina, installed all the windows,” Hunter recalled. “She was assisted by several others as the count grew to fifteen thousand. There were ten different types of windows, some injection molded, others laser-cut, that were categorized and painted a specific color for each building. What became critical, dealing with that many windows, was making sure that the window openings were specifically the size of the corresponding window. If they were any different, we would have had to trim the window openings or the windows themselves – and dealing with thousands of windows, that would have been a big deal. So we tried to be very particular about getting exact fits.”

Once all fifteen thousand windows were cut and fit into their corresponding building faces, there remained the laborious task of dressing them. “All of the windows that were lit up had some kind of detailing in them, such as curtains and things,” Gress related. “In fact, on the twenty-fourth-scale Hudsucker Building, every window had something in it, even if there was no light, because the camera moved right by them and you could see inside. So we couldn’t leave them blank.”



From camera tests conducted by Mike McAlister, it was determined that the skyscraper models needed to be completed on only two sides for the opening fly-through of the city. Onesided flats sufficed for background buildings.



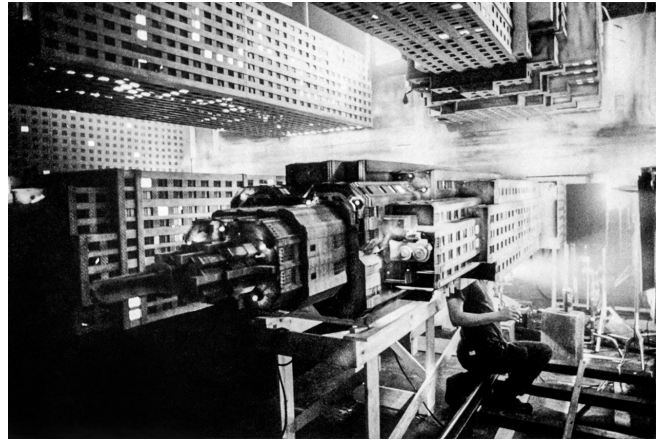
The finished composite featured digitally produced snow and a live-action element of the forty-fifth-floor window which was ‘nested’ into the model by Computer Film Company.

When completed, the twenty-fourth-scale buildings – which stood from seven feet to twenty feet tall – were transported to the Carolco Studio in Wilmington, North Carolina, where both the live-action and miniature shoot was scheduled to take place. Although the buildings were assembled vertically for the opening fly-through, they were hung horizontally to accommodate the two jumps: Hudsucker's death leap that sets the action of the film into play, and Norville's aborted and ultimately enlightening dive at the end of the movie. The horizontal configuration facilitated motion control camera moves on the buildings that would be merged with bluescreen footage of the characters falling. "Very often in miniature work," McAlister explained, "you configure things in bizarre orientations that will work the easiest – especially when gravity comes into play. In this particular case, it was essential. Basically we set up a canyon of skyscrapers that represented two sides of a street in downtown Manhattan – sideways. The Coens wanted to shoot straight down with a really wide-angle lens, which meant that you saw the building that the person was jumping out of and you saw four or five buildings to the left and right, as well as eight or nine buildings across the street. We could have shot the city in a vertical configuration with a descender rig or something, but it would have been a nightmare. We would have needed to travel the camera up and down the building, a vertical move of up to forty-five feet, rather than traversing parallel to the ground – a much easier option. And lighting it would have been out of the question. For the day sequences, we needed to key the scene from a high-noon position. With a fifty-foot miniature Hudsucker Building, that would have required a very tall stage – and we didn't have one."



The miniatures were also featured in two multi-story falls that bracket the film. In the first Waring Hudsucker (Charles Durning) leaps from the forty-fifth floor of the Hudsucker Building – a fall that was essentially duplicated by Norville near the end. Motion control moves on the skyscrapers were combined with bluescreen footage of the actors on wires. While the cityscape had been oriented vertically for the opening fly-through shot for the fall sequences the buildings were mounted horizontally to facilitate motion control photography.

The number of buildings required for the horizontal shoot kept growing as the Coens opted for wider and wider lenses for the jump sequences. “The buildings had been designed for an eighteen millimeter lens,” McAlister recalled, “but as we tried a fourteen millimeter lens and then a ten millimeter, we liked the shots more and more. But to use something that wide meant that we needed more buildings – immediately.”



A crew member attends to window dressing and lighting inside the miniature Hudsucker Building. To prolong the falls for dramatic effect extension panels were added to the horizontally configured buildings.

Some speedy improvisational design was required of the on-site Stetson crew. “We hung seven of the buildings overhead and put eight of them on the ground,” recalled Hunter. “Then we took all of our background flats, which were two-dimensional buildings intended only for the fly-through shots, and framed them together to make at least a three-dimensional corner building which we could hang and then position on the periphery. Danny Samppala, one of our standby modelmakers, made another ten duplicates of our facades, giving us a total of thirty – but even that wasn’t enough. We ended up having to take some cutouts that live-action had used behind windows and hang those on the walls of the stage to fill out the space. Another problem was that we had only built twenty-four feet of roadway, and the road ended up stretching the full length of the stage. Fortunately, we had brought a forty-foot trailer full of tools with us from Los Angeles and had set up a model shop in a warehouse directly across from the stage.”

Working in tandem with the twenty-fourth-scale skyscrapers was the like-scaled Hudsucker Building which was also positioned horizontally and served as the site of the two stunning and oddly beautiful fall sequences. McAlister had calculated that a person jumping off of the forty-fifth floor of a building would take approximately seven seconds to hit the pavement. However, to heighten their dramatic impact, the falls were extended so that Hudsucker and Norville would spend nearly thirty spectacular seconds plummeting toward the street below.

To create the longer falls and exaggerate the downward perspective, extension pieces were inserted into the horizontally-positioned buildings, augmenting them substantially. The Hudsucker Building, which measured about thirty feet vertically, was stretched to a whopping fifty-five feet in its horizontal configuration. The Chanin Building was a close second at approximately forty-eight feet. “For the most part,” said Stetson, “the extensions were five-by-ten or five-by-eight panels that were suspended just for these shots. It was a tough way to go, as it turned out, because the panels were flimsy, and trying to line them up in long straight rows that were closely revealed by the camera was extremely difficult.”

With the miniatures in their horizontal configuration on the Wilmington stage, Mike McAlister was able to orchestrate the filming of the two fall sequences. Envisioned by the Coens as very stylized, both falls began at the same spot on the forty-fifth story of the Hudsucker Building. “The way the Coens were going to cut the footage,” McAlister commented, “the falls were going to take five or six

times longer than the laws of physics demanded – and the audience was going to have fun on the way down. The Coens didn't see them as particularly morbid sequences. They were done humorously and in a light-handed way – as you might expect from them.”

By design, the two falls are essentially identical, with the camera setups and angles established for Hudsucker's early jump intentionally repeated for Norville's leap at the end of the movie. “The idea was to make the audience think, ‘Hey, we've been here before and Norville's going to hit the pavement!’ But then it doesn't happen that way and it's a bit of a surprise. The only real difference between the two sequences is that the first one takes place during the daytime and the other one takes place at night.” Each jump consisted of eight to ten lingering shots. “These were the biggest falls I'd ever seen – and they gave us the opportunity to do more than we could if there'd been only three or four cuts. We could spend money to build and shoot elaborate miniatures and amortize the cost over a couple of sequences. That made it affordable.”

Previsualizing the sequences was initially difficult. “There were no reference photos anywhere that we could show to the Coens so they could say: ‘Yes! This is what we want!’ So I went to New York to do some still shots – just to get a sense of what we were talking about in terms of lighting and angles – but I still couldn't get angles that truly represented the POV of a person in midfall.” After the New York shoot, McAlister enlisted Stetson Visual Services to do some videomatics with roughed-up foamcore building models. “It was a way to choreograph some camera moves and answer some questions concerning the movement of the characters and camera.”

As they appear in the final film, the fall sequences feature a variety of camera moves. In some shots the camera is locked off, with the character flying either towards or away from it. “Other times the camera is falling down the face of the building and the foreground is essentially swimming in front of it. Sometimes the camera is rolling on the axis of the building, spinning as it pulls down to the ground. In one case, we started with the camera pointing up and then falling backwards as the character falls past the lens. As the character passes, the camera tilts 180 degrees and is chasing towards the street in the opposite direction. We'd shoot from the bottom of the building for the up-angle and then we'd stop the camera and quickly go to the top of the building for the angle looking down. The two separate shots were blended during the tilt. In this way, the building height was exaggerated once again.”

Awaiting the arrival of the two jumpers from above was a complete miniature street which evidenced the hustle and bustle of city life. The street surface itself was made of a soft neoprene rubber that was glued to wood. Slots were cut into it to accommodate four twenty-fourth-scale motion control cars – painted in the same muted brown tones as the city – that were to travel up and down the expanse. “We set up tracks on the backside of the road,” said Hunter, “then cut through the rubber and wood and slid a sheet of aluminum, like a little aluminum knife, through the roadway. The cars were attached to that; so as they passed through the slot, the slot would be self-closing. The knife was attached to a cable loop that went to a stepper motor; and the stepper motor was hooked up to the drive of the motion control camera.”

The street miniature also featured realistically detailed sidewalks and functional streetlights. So convincing were the sidewalks, in fact, that the production company was able to use the miniature for a shot that had originally been slated for filming on a full-size sidewalk section. “They had

planned to throw a camera off one of the full-size buildings to get the last bit of one of the falls,” Ron Gress explained, “and it was going to come to within inches of the sidewalk. They were planning to build a sidewalk set, but they tried an experiment to see if our little sidewalk – which had been painted and weathered by Renee Rabache – would hold up all the way to the ground. And it did. So they were able to use a motion control camera on the miniature instead of having to build another set.”

Final set dressing on the street miniature included newsstands, garbage cans and fire hydrants. “We also added something that had purposely been put in the live-action,” Stetson said, “which was a little road construction area with barricades and flashing lights. It was something to catch your eye and hook the live and miniature scenes together. We also had scale people in various poses. Those are the things you keep adding until the moment the camera rolls. The more detail you can include, the more realistic it will look.”

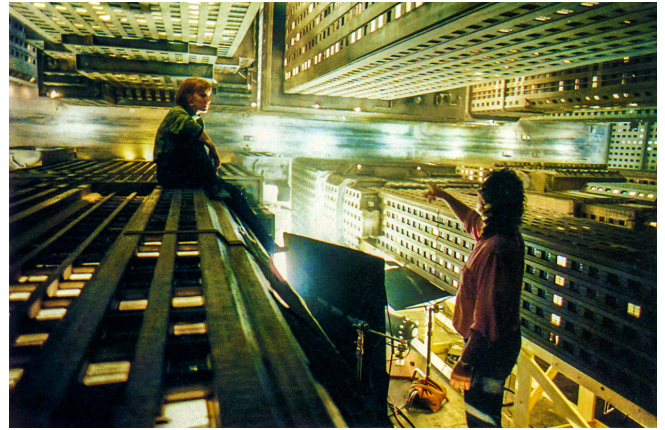


Ian Hunter inspects the alignment of the suspended miniatures.

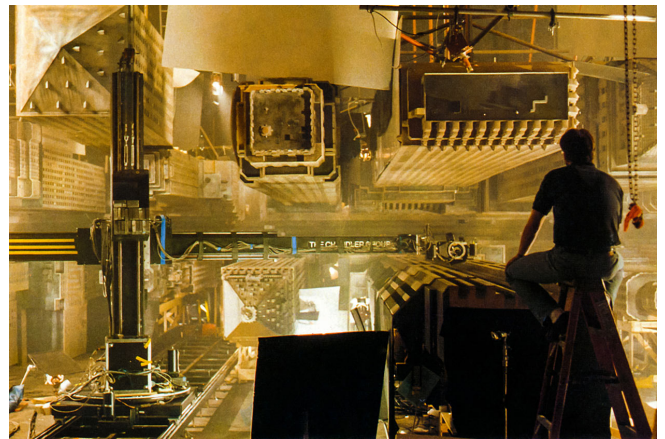
Much larger in scale than the miniature street was the sixth-scale clock section of the Hudsucker Building which was employed for a camera pullback through the boardroom window as Mussburger witnesses Hudsucker's messy encounter with the sidewalk below. The larger scale of the clock section was required so that the camera could physically fit through the window and hook up to an interior shot of Mussburger that had been filmed on the live-action set. The most prominent feature on the model was the neon-detailed clock which measured nearly five feet across. "The clock was the jewel of that model," said Hunter. "The Hudsucker art department came up with a design sent to Envision Design, a company that laser-cut panels to lay on top of the plexiglas face. On the face of the clock was a ripple texture that was added with a decoupage material that crinkles up when it dries." The face was mounted onto a steel frame and the hands were attached to a stepper motor with a belt drive.

The clock also featured miniature neon in the form of a second hand that moved around the clock face and a neon 'The Future is Now' inscription. Both were created by Larry Albright. "Chris Cowan built a commutator that allowed us to power the neon," Hunter noted. "Normally we'd want to have a hard cable in there, but we couldn't do that because the second hand was rotating and it would have eventually wound the cable up and snapped it." Albright also fashioned the Hudsucker logo in neon. "The neon put out so much radio frequency that the radio controlled head on the camera they were trying to shoot with kept running into interference every time they got within three or four feet of it."

On the twenty-fourth-scale version of the Hudsucker Building, the neon logo had been simulated by a piece of milky white plexiglas. The letters were laser-cut by Envision and placed on the piece of plexiglas; then the edges were painted, opaqued and finally backlit. "Strangely enough," Hunter remarked, "it looked exactly like neon." Because the camera was to pass within twelve inches of the twenty-fourth-scale building, the clock hands had to be lit very carefully to match the hands on the bigger sixth-scale model. Determining that neon at that small a scale would be impractical, the Stetson team came up with a reflective approach to simulate neon. "We surrounded the camera lens with a ring of light projected directly at the clock. The problem with that approach was that if



Model painter Renee Rabache and lead model painter Ron Gress on the set. The setup for the fall sequences included a street miniature that was slotted to allow for movement of motion control cars attached to a track beneath the neoprene rubber pavement.



A motion control camera travels down the face of the Hudsucker Building. Because of a last-minute decision to shoot the fall sequences with an extremely wide-angle lens – which would reveal not only the Hudsucker Building as Norville or Hudsucker dropped, but also a number of surrounding structures – additional scaled buildings and flats were hastily added to the miniature setup.

we were anywhere off-line, we would lose the reflection. In a last desperate moment, we decided to use Mag-lite bulbs – which are very nice, bright halogen lightbulbs – and we put a string of those together with the heads pointing directly at the lens. We wound up using sixty-four of these bulbs wired in series on a clock hand that was only eight inches long.”

Ultimately, *The Hudsucker Proxy* proved to be one of the most labor-intensive projects ever taken on by Stetson Visual Services. The result on film, however – a fantasyland New York which provided beautiful visual support to the allegorical tone of the movie – proved well worth the effort. “I have never seen miniatures like these – ever!” McAlister remarked. “It was a shame that they were tucked away in North Carolina where nobody could see them. When the city was all set up and lit, it was an amazing sight.”

Another contributor to *The Hudsucker Proxy* was Peter Chesney, who served as mechanical effects supervisor. Like many others on the film, Chesney was no stranger to the Coens, having previously delivered special effects for *Raising Arizona* and *Miller’s Crossing*. Chesney’s work for *Hudsucker* included devising wire rigs to ‘fly’ actors Charles Durning and Tim Robbins for the all-important fall sequences. Working closely with Mike McAlister, Chesney’s first task was to address the specific problems of *Hudsucker*’s jump from the forty-fifth story boardroom window. “We wanted a low angle looking up at him as he fell towards camera,” Chesney explained, “and we needed a real person going through real glass from the specific angle. But no matter how I moved the camera around or fooled with lens choice or different heights, the camera and the stunt fall bag below – which the stuntman would jump into – were always in the way of each other. And because he had to jump out the window horizontally, we couldn’t use a cable descender to stop him before he hit the ground.”

A solution which eliminated the need for the stunt bag was rigged at the North Carolina warehouse where Chesney’s crew had set up shop. The roof of an office area at the warehouse provided a rock-solid platform upon which a false boardroom could be built. “We built a ten-by-ten-by-twenty-foot light box and covered it with black duvetyn so that daylight wouldn’t come through,” Chesney explained. “We also built a ceiling piece of a solid color – which, in digital, would do the work of a bluescreen – and we had a candy-glass window set into a frame.” On either side of the platform and box, Chesney’s crew positioned a twenty-foot crane and an eighty-foot Condor, with a line suspended between them. Spliced to the line was a flying wire cable that was attached to stunt coordinator Jerry Hewitt – who doubled for Charles Durning – by way of a special plastic and fiberglass climbing harness. “We also had a tiny drag line on his heel that picked up about four pounds of weight in order to keep him in line.” The complex setup created a kind of pendulum swing that enabled Hewitt to fly out of the breakaway glass window and begin a fall while suspended by wires. “Half a dozen people manned the ropes. As they ran forward, the hanging point for Hewitt would move forward until it was outside the window. We had a split in the light box and in the framing so the wire could clear through the ceiling and the window transom. When the crew on the rope ran forward, it created a kind of a pendulum. The best way to describe it is to imagine sitting in a swing in a play yard and you are at rest. Six guys pick up the swing set and run forward ten feet. As they run forward, you go up behind them. They stop, and you swing past them, going up and swinging forward. Then they pick up the swing set again and run forward so that you go straight back down relative to the ground.” From the perspective of the camera, the complex rig

provided a graceful stylized trajectory – just what the Coens wanted. “It was semi-simple, except for figuring out all the physics involved.”

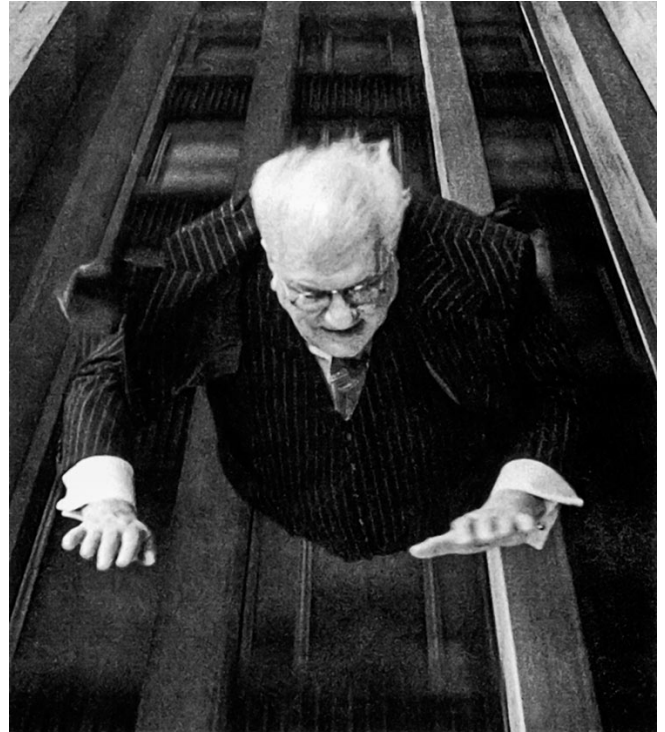


Composited with the motion control backgrounds were elements achieved by photographing Charles Durning on wires in front of a bluescreen. Mechanical effects supervisor Peter Chesney and crew directed venturi-tube air movers on the actor to simulate a free-fall rush of wind.

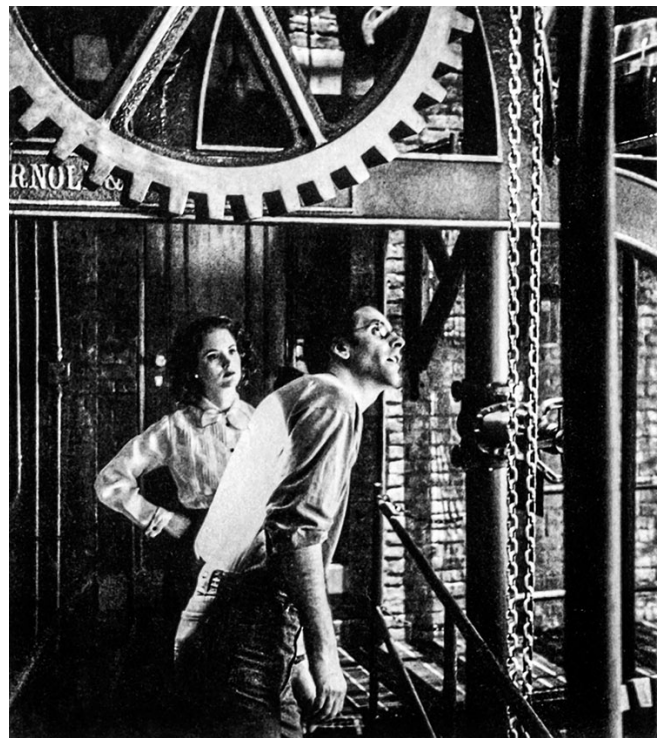
Subsequent shots of Hudsucker's leap were achieved more simply, with Durning himself hung on wires and photographed on a bluescreen stage. All the falling elements were then digitally composited with motion control shots of the background which had been photographed wide-angle on the horizontally positioned miniature set.

Though similar in concept, Norville's fall presented a different set of challenges. Rather than drop Robbins on a wire rig toward camera – thus running the risk of a collision between actor and camera – the sequence was filmed in reverse. “We started him right above the lens and then elevated him up to the rafters of the stage as quickly as we could,” McAlister explained. “Because the scene was shot in reverse, Tim also had to act in reverse – which was an interesting challenge since he was supposed to be terrified on the way down, come screeching to a halt, realize he's okay, and then think, ‘Hey, what gives?’ He had to do all that backwards.” In conjunction with acting out the emotional content of the scene in reverse, Robbins also had to perform his physical reactions backwards. To suggest a certain amount of inertia as he came to a stop, his arms and head – in keeping with Newtonian physics – had to continue to move forward.

An after-the-fact overriding zoom created the impression that Norville traveled much farther than Robbins was actually hoisted. “In reality, he was traveling only twenty feet, which wasn't nearly enough. He needed to look as if he were falling four hundred feet. So we added an overriding zoom during the composite process at Computer Film Company in Los Angeles to make him look as if he were starting very, very small. As he got closer and closer to the lens, we'd do a blend between the computer portion of the move and the live-action portion so that it looked continuous.” The overriding zoom also created the illusion of great velocity, increasing Robbins' real speed of ten miles an hour to an apparent one hundred miles an hour.



Digital compositing for the sequence was realized by Computer Film Company. Conceived by the Coens as humorous interludes, the film's falls – both nearly ninety seconds in length – were timed with blissful disregard for the laws of physics.



Director Joel Coen and actress Jennifer Jason Leigh prepare for a scene in the Hudsucker Building clockworks, a Rube Goldberg-like set designed by Dennis Gassner.

To create the buffeting clothing look that would be evident in such a fall, Chesney initially intended to use wind machines – aircraft propeller engines – directed at the actors. After tests to measure wind velocity and its effects, Chesney determined that a very real sixty-mile-an-hour breeze would be needed to create the desired free-fall effect. “I found that sixty miles an hour didn’t look much different from one hundred twenty miles an hour. At a certain speed, the clothes blur and the skin is pressed back – and those effects don’t increase significantly at a higher speed. But even at just sixty miles an hour, the wind created a serious logistical problem. To get that velocity, we had to place our wind machines fairly close to the actors because high velocity wind is not thrown very far.” With such close proximity, though, safety became an issue. “A stray hose clip, washer or bit of muffler rust thrown out at sixty miles an hour at close range could have caused serious damage to the actors’ eyes or skin.” To prevent such a calamity, Chesney and crew switched from wind machines to air movers. “An air mover is a very simple venturi tube that uses high-pressure compressed air spraying forward that, in turn, pulls more air in from the back of the tube. With the air movers, we were able to create winds of nearly ninety miles an hour in a small, confined stream. It was a very elegant solution because the machines have no moving parts and our safety problem was reduced by a factor of fifty or so. It also gave us extreme control over the air flow. One guy would blow the actor’s face, another his pant legs and another his shoulders.”

Complicating the nightmare falling scenes was the almost continual snowfall – an aesthetic element featured throughout the movie. “Whenever it is nighttime, it is snowing in the movie,” noted McAlister, “and to get an element of snow that was deep enough in perspective to look as if you were seeing snow that was falling forty-five stories was an enormous task. We had the option of shooting plastic snow falling towards the ground; but that gave us only thirty or forty feet of travel, which was inadequate to create the feeling of depth ad infinitum. The particles of snow needed to be so small that in the distance they would look like haze.” Eventually, McAlister turned to computer generated snow particles – created by RGA/LA – to augment the sense of depth and perspective. “The problem with the CG snow initially was that we missed the interplay of snow between the camera and the foreground character. For instance, there’s a shot where Norville is hanging by his fingertips on a ledge. The camera was sitting above him with forty-five stories of building below him and the snow falling very dramatically. But there was a lack of snow between the camera and his face. So we shot a special piece of live-action snow to occupy that space. The question of creating realistic snow for this sequence persisted from the first production meeting until the last composite was finished. The Coens and the producer, Graham Place, kept asking me: ‘How will you do it? Will it look real?’ I promised them it would look real, even though I didn’t exactly know how I’d pull it off. It’s funny, but the first thing Graham said to me after the premiere was that the snow looked absolutely real. He hadn’t seen a finished composite until then, and I guess he wasn’t truly convinced it could look so good. The snow was a rather subliminal component of those shots, but if it had been done poorly it would have destroyed the sequence.”

Norville’s free-fall descent comes to an abrupt halt halfway down the building, leaving him suspended upside-down in midair. Suddenly, a descending winged figure dressed in white appears in the snowy sky above. It is the angel Hudsucker and he has come to unravel a few mysteries for Norville. For the comedic sequence, the Coens had wanted an angel that was part supernatural, part machine. Outfitted with halo, harp and cigar, the angel Hudsucker also sported a pair of slightly

awkward, almost clunky wings. Peter Chesney took on the project of designing and developing the wing assembly. “They were looking for something that was reminiscent of the wings in Brazil, but with a specific style in mind. I went through some early stick-figure tests with a little doll using simple push-rod mechanics; but they were too clunky, so I came up with a compromise that was eighty percent birdlike wing mechanics and twenty percent backyard mechanics to create a deliberate clumsiness in the wings.”



Disgraced and denounced as a fraud, Norville contemplates a suicide leap, but instead slips and falls from the icy ledge of the forty-fifth-floor window. A live-action element of Tim Robbins dropping away from a full-size ledge section was digitally composited – by Computer Film Company – with footage of the miniature skyscrapers and computer generated snow.



In keeping with the comedic style established in the earlier fall, Norville’s descent toward the pavement was photographed from a variety of camera angles, including down angles on the body falling toward the street, and up angles with the body falling toward camera. Because Robbins was hoisted a mere twenty feet on the bluescreen stage, Computer Film Company executed an overriding zoom on the footage to suggest greater distance in the fall.

To develop the mechanisms, Chesney studied slow-motion footage of doves in flight. “We found, after going through all the research, that the geometry of the wing movement most desired by the Coens was specifically like that of a dove in hover – which is a very definite, specific movement. The wing starts up, comes down, then moves forward as it cups the air – kind of a backstroke movement, like reverse flapping.” Chesney attempted to duplicate the movement with a full-size prototype wing. “The mechanics were fairly complex. The whole thing was radio controlled for on/off and park; but it was all relay and limit-switch technology for the wing cycle. Electronic speed controls governed little hand-made linear drives. It was based somewhat on a locomotive engine in that it used rotary motion translating to linear motion with linear bearings. That linear motion was translated through cables over pulleys into the main power to lift the wings.”



Rather than hit the pavement as his predecessor had done, Norville inexplicably comes to a halt in midair and is visited upon by the angel Hudsucker. For the sequence, Charles Durning was fitted with a sixteen-foot mechanical wing apparatus designed and built by Peter Chesney.

Over the metal frame and mechanics, bleached turkey feathers were hand-sewn to a stretchable backing. When completed, the apparatus weighed approximately thirty pounds and had a wingspan of sixteen feet. The wings were attached to one wire in a three-wire flying system that flew Charles Durning into the scene. To enhance the actor’s comfort in the flying harness, twenty-five of the thirty pounds added by the wing apparatus were carried by the support wire. “The wings were structurally attached to Durning with belts. A backpack was cast to fit his form and the wings were attached to that. We made some very big moves with the wings; and they quite literally bounced him around, like real wings would.” Only the thinnest motors and gears were employed to insure that the wing assembly remained concealed, even in profile shots. “Getting all the mechanics into a two-and-a-half-inch-thick package was a real design challenge. It meant that we had small mechanisms that were forced to run at their limits – so maintenance was ongoing. My lead mechanics designer, Ralph Kerr, was constantly maintaining the wings.”

In addition to miniatures and physical effects, the surreal environment of *The Hudsucker Proxy* required two matte paintings by Mark Sullivan who was engaged to create an interior view of a vast hula hoop warehouse as well as a specific angle on the Hudsucker Building.

The hula hoop warehouse – conceived in a drawing by Dennis Gassner – was to reveal forklifts driving towards camera, down tremendously long corridors flanked with stacks and stacks of unsold hula hoops. “I don’t think they ever considered just finding a big warehouse and shooting the whole thing practically,” Sullivan recalled. “They wanted to do it as a matte painting so they wouldn’t have to build trillions of bundles of hula hoops.” The live-action forklift footage was shot outside the Wilmington studio on an overcast day. “It was a good day to shoot an exterior that was going to be used as an interior. Because it was overcast, it allowed me to go for a look of diffused light coming through skylights in the painting. If there had been really harsh shadows, the plate wouldn’t have made sense, since you wouldn’t see that kind of light inside a warehouse.” As the

shot was to be a latent image composite, the forklift footage was sent undeveloped to Sullivan's studio.

To develop the look of the warehouse, Sullivan made research excursions to steel mills in the *San Francisco* area. "I went to large interior structures and took photos which were sent to Mike McAlister, Dennis Gassner and the Coen brothers to solicit feedback on the design of the painting. I also did a small painting over a frame blowup of the forklift element. We went back and forth a couple of times before we nailed the concept down. What the Coens wanted in the shot were hula hoops stacked so high that they resembled skyscrapers within the interior of the warehouse. To break up what could have been an incredibly monotonous and confusing shot, we put in shadowed areas. The skylights in the ceiling were arranged in parallel lines so we could have bright, sunny areas contrasting with areas that were shadowed and silhouetted. That really helped to add interest to all these rows and rows of hula hoops." To marry the live-action plate footage, Sullivan painted a skylight that ran the length of the warehouse directly over the corridor the forklifts were traversing – thus making sense of the diffused sunlight falling on the forklifts.

For further visual reference, Sullivan hired a modelmaker to construct about three hundred miniature replicas of the few hula hoop bundles that had been built full size for the main unit shoot. "I arranged all these model spools on the floor of my studio in Berkeley," Sullivan recalled, "and took reference photos of them to give me ideas for the arrangement, how the bundles should cast shadows on each other and as a perspective guide. This shot was particularly difficult because it's always tricky dealing with ellipses in a painting – and here I had several thousand of them."

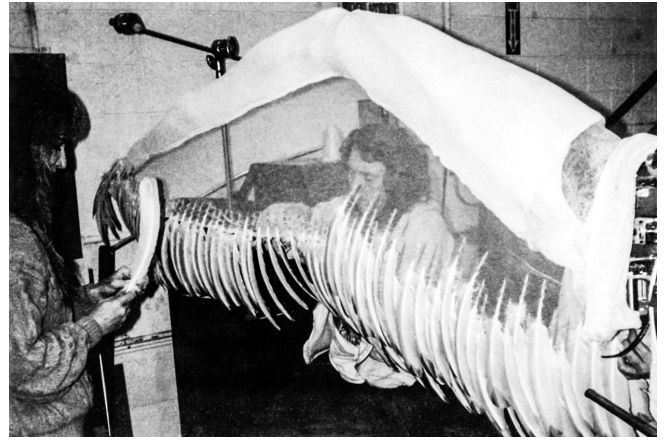
A second matte painting was needed for a shot in which a newsboy shouts out the day's headlines in front of a street setting. The camera tilts up quickly to a view of the Hudsucker Building rising skyward almost into the clouds. "The shot was intended to show the immensity of the edifice in the background," Sullivan explained. "I painted the building going up to the sky. I painted in sunlight coming through the clouds and lighting up the upper part of the building, and left the lower part in shadow. I thought that would make it more dramatic, and keep it from looking flat."

Computer graphics tools were employed to accomplish the matte painting. McAlister supplied Sullivan with a mockup of the Hudsucker Building that was scanned into the computer to provide a basic shape for a computer replication of the building. Using that data as reference, digital artist Richard Cohen built a wire-frame model which corresponded – in size, shape and perspective – to the building in a frame blowup of the foreground plate. Cohen then texture-mapped a photo of the building onto the wire-frame model. "That gave us a black-and-white image of the building that was locked into the same perspective as the foreground plate," Sullivan explained. "Next we had a three-by-five-foot photo enlargement made of this computer graphic image that I painted over in oils, adding the sky background and little details like blinds in the windows and weathering streaks. It was sort of a marriage between traditional brush matte painting and computer graphics."

Digital tools were also instrumental in creating transligh screens that were hung behind the miniature city sets to simulate background buildings quickly and economically. Using their digital matte system, the computer graphics team at Industrial Light & Magic produced three translighs for the production. Photographs were taken of existing buildings, then cut and pasted into a collage that was filmed out to large eight-by-ten negatives. The negatives were then sent to Pacific Title & Art Studio where the translighs – also called duratrans or chromatrans – were made. “It was sort of a groundbreaking experiment,” McAlister noted, “because ILM needed to work at a higher than usual resolution and we had a few problems getting a good film negative image from the digital image. There were a lot of subtle unpredictables in going from eight-by-ten negatives to a huge screen that was eighty feet wide. A lot of things show up at eighty feet that aren’t apparent in an eight-by-ten. Because duratrans screens are generally made from more than one negative, they are seamed together. That meant that the edges of the individual negatives had to come together and be color balanced and density balanced exactly right – and the output device we were using wasn’t quite tuned in well enough to make that seamless. So we had to do a considerable amount of retouching on what was essentially an eighty-foot-wide, forty-foot-tall transparency.”

Because of the difficult nature of some of the composites in the film, Computer Film Company was engaged to digitally assemble shots that could not be effectively done through traditional optical methods. A London-based company, CFC is unique in that it limits itself to digital compositing and has no computer graphics capability. “We are probably the only company in Hollywood that does digital film compositing and nothing else,” commented company vice president Stuart McAra. “We were particularly keen to do Hudsucker because we understood it to be a project where quality was paramount.”

Computer Film Company had opened an office in Hollywood prior to their first contact about participation in Hudsucker, but had not yet shipped their equipment stateside. “We were already very much committed to bringing people and equipment across when Mike McAlister approached



Though its movement was imitative of doves in flight, the radio-controlled wing assembly was designed to impart a sense of primitive mechanics. To ensure the mechanisms would not be evident in profile shots of the angel Hudsucker, Chesney and his engineering team packed extremely thin motors into a three-inch-thick housing. Members of the crew attach bleached turkey feathers to the wing assembly.



Before Norville’s invention catches on, spools of unsold hula hoops are stored in a Hudsucker warehouse. Rather than build millions of hula hoops, the production opted to depict the scene through a matte painting rendered by Mark Sullivan of Compound i. Live-action footage of warehouse forklifts – shot outside on an overcast day – was combined with the matte painting in a latent image composite.

us,” McAra said. “Fortunately, his schedule tailored in perfectly with our plans.” CFC’s assignment was to complete approximately sixty digital composites that were complicated by added motion blur, snow elements, bluescreen and greenscreen components and wire removal. In addition, several composites required precise ‘nesting’ of live-action elements within miniatures.

One such nesting shot was featured in the film’s opening. “The first shot in the movie we did at the very end of our production schedule,” McAlister noted. “It is an extremely wide-angle view of the tip of Manhattan with the Hudson River in the foreground. The camera is looking out over the water and drifting toward the city with this Emerald City-like lighting in a night shot with snow falling. A series of two or three dissolves explores this mythical environment, until finally we see the Hudsucker Building in the distance. Then, a pair of window lights come on next to the clock. The camera continues to drift towards the clock and the top of the building, which was the miniature.” As the camera continues to advance towards the Hudsucker Building, Norville is revealed climbing out of the forty-fifth story window. “That live-action came at the end of a very long move on the miniature. We built a full-size set piece of just the window outside Norville’s office and did a wild camera move – a non-motion control camera move – with Tim Robbins crawling onto the ledge. We just drifted in on a crane right into a closeup; and that element was later nested inside the space in the miniature corresponding to that particular window section. Marrying a live-action image with a painted or miniature element was, of course, nothing new. But to do it on a moving shot that started on a hundred-foot view of a building and then zoomed into a closeup of a character standing outside a window, that was pushing the state of the art – and the only way to do it was with computers.”

Using their digital tools, Computer Film Company managed to seamlessly blend the miniature and live-action elements. “They were able to do the nesting in such a way that the window wasn’t jiggling inside the miniature,” McAlister remarked. “The image is absolutely locked in and registered, and the lighting is perfectly matched.” The shot continues as the camera pans off Robbins and up to the miniature clock. “There’s a split midway through the pan. So there are two seams in this one shot – and they are absolutely flawless. You can’t tell that they are not the same environment.”

The digital nesting technique was employed also in a later shot, after Hudsucker crashes through the window and falls to the pavement. “We go back up to the window to find Sidney Mussburger looking out through the broken glass,” McAlister explained. “The shot is wide and Paul Newman is standing there looking through a real window with the clock face above. The window was a practical set and the clock was a miniature. The camera starts on the clock, tilts down and pushes off the miniature, through the broken window and into Paul’s face; then Paul turns and walks back into the boardroom. CFC nested the live-action piece into a miniature using the power of the computer to make sure that it was perfectly registered and all the colors matched well.”

The third nesting shot appears at the end of the movie. The camera is looking down an elaborate boardroom table while Norville is sitting at the opposite end. He stands and throws a frisbee towards camera. “The camera backs up down the table and the frisbee exits the frame close by. The camera continues backwards through the open window and tilts up to the clock face into a wide shot of the building. So this was the same nesting concept, only in reverse. CFC added the clock face

and the top of the building to what was otherwise a live-action set piece. There was a split across the top – which was difficult, but executed flawlessly.”

Approximately thirty shots within the two fall sequences also benefited from digital manipulation, with wires used to suspend the characters being removed through the employment of a digital paint system. “We can filter out some of the finer, smaller-detailed things such as wires fairly easily,” noted CFC senior designer Janek Sirrs, “but it becomes more of a problem when the wires cross over the character. David Fuhrer laboriously painted out wires that passed over extremely complicated areas such as patterned jackets. It was very important that the textures be just right underneath.”

Coming off an extended leave of absence, Micheal McAlister was astonished by the advancements that had been made in the computer graphics arena in just a short period of time. “The last movie that I did before *Hudsucker* was *Die Hard 2*,” McAlister commented. “Then I took a year off and played with my daughter and wrote a book [The Language of Visual Effects – Lone Eagle Publishing]. When I got into prepping for *Hudsucker*, I was staggered by how much had changed. It wasn’t too long ago that the kinds of composites CFC achieved for us would have been impossible.”

By any standard, *The Hudsucker Proxy* was an enormously ambitious effects film. And yet the vast majority of moviegoers will not perceive it as such. Most likely, audiences will see the film as another humorous, highly-stylized, yet essentially simple fabrication from the inimitable Coen brothers. And that is as it should be. “I’ve seldom been involved in visual effects work that was as spectacular in scale and concept as this project was,” McAlister concluded, “but it’s not likely that audiences will come away from this movie with a sense that it was a major visual effects undertaking. That’s the irony of the kind of work I like to do. In some cases, the work is so invisible that nobody realizes you’ve done it – and that’s great, because, for me, that’s the whole point of visual effects.”

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VIDEO BEAT VIPER SHEDS ITS SKIN

article by Bob Pieshel

It is *the day after tomorrow* – the plausible near future. A vicious crime syndicate known only as ‘The Outfit’ ravages a futuristic city. No ordinary cartel, its members deal only in high-tech crime, using sophisticated weapons to steal satellite components, rare plague antitoxins and computer chips. The only thing standing in their way is a vehicle that can transform itself from a high performance sportscar into a high velocity pursuit and capture vehicle, armored and bristling with defensive and tactical equipment – the Viper.

Created by Danny Bilson and Paul De Meo – the team responsible for *The Rocketeer* and *The Flash* television series – Viper displays some groundbreaking visual effects and computer generated imagery. Tasked with realizing the high-tech world of this new series were visual effects designer Robert Bailey, visual effects supervisor Glenn Campbell and visual effects coordinator Susan Jones.

The first order of business for the effects team was locking in the pivotal transformation of the red Dodge Viper into the Defender – a vehicle that had been custom-built for the show by Chrysler. From the outset it was determined that computer graphics was the only way to depict the transformation. “We wanted the transformation to look mechanical, and not be like a *Terminator 2* liquid morph,” said producer Michael Laco. “The question was whether CGI could make this evolution between the cars look as if it were mechanically justified.”

“The philosophy governing all the visual effects on the show, especially the transformation, was that there be a scientific or technological basis for whatever we were seeing,” Bailey elaborated. “We wanted to insure that viewers saw the exhaust pipes retract and be replaced by missile launchers in a very mechanical fashion. A traditional morph could only approximate that look; so we had to have a 3-D transformation.”

A number of prominent computer graphics studios were offered the project, but turned it down flat. “The feeling was that it could not be done,” Campbell noted. “Viper required a CGI car that not only transformed, but did so while driving down the street at 45 miles per hour. That meant photographing a real Viper racing down a road, then introducing – without detection – a photorealistic CGI Viper that would transform into a CGI Defender and finally into the real Defender racing along the same stretch of road.” Small wonder that many companies bowed out gracefully.

One company that did not, however, was MetroLight Studios, a computer graphics facility that had earned kudos – and an Oscar – for its digital effects work on *Total Recall*. Rather than shy away from the challenge presented by Viper, the team at MetroLight – headed by producer Mark Franco and production coordinator Tamara Watts – embraced the project with enthusiasm.

The first step in creating the Viper-to-Defender transformation required that Viewpoint DataLabs – a 3-D dataset supplier – map coordinates onto both the Viper and Defender cars, then scan them into their computer. MetroLight modeler Alan Ridenour massaged that data and determined the correspondence of vector points between the vehicles. To their dismay, digital effects supervisors

John McLaughlin and Kelly Ray discovered that Chrysler had not constructed the Defender from the existing Viper database, but had literally sculpted a new car from scratch. “We had always assumed that the cars would more or less match,” McLaughlin said, “but since they were so different, they did not have the same number of points or the same amount of area in any given part. So it took a considerable amount of modeling to get from one car to the other.”

Because Chrysler’s Defender was wider than the Viper and had a longer wheelbase, the car had to physically stretch and expand during the transition, thus requiring that the effect incorporate the very thing the team had sought to avoid – a stretch morph. While the stretch morph could not be avoided entirely, the Viper effects team set out to minimize its employment. Working in conjunction with conceptual artist Darren Gilford, the team coordinated the breakdown of the transformation, separating the effect into mechanical elements – such as the roof pieces extending – and warping elements, where actual pieces of metal would stretch and bend. “There were areas that had to warp, by default,” admitted Kelly Ray. “There was simply too much mass in one car that had to be accounted for some way in the other.”

Between the two cars, the final transformation involved more than one hundred moving parts, each of which had to disappear or be revealed in precise sequence. While it had been hoped that a single transformation file would work for all shots – simply matching the CGI Viper into each background plate and adjusting the lighting – it was soon discovered that what looked terrific at one angle might be hidden or just uninteresting from another. Thus, each shot became a custom assignment. “Each individual shot had its own special choreography that was layered on top of the master choreography,” Ray explained.

As the transformation is executed, a hexagonal, reptilian surface appears on the Defender. “The hexagons are texture-mapped onto the car model through RenderMan software,” said McLaughlin. “They are not part of the geometry of the car. A bump-mapping technique is also used to change the surface normals and alter the angle of incidence, in effect warping the portions of the reflection map that it is seeing.” This hexagonal effect hides the transition from real car to digital car, serving as a distraction to the eye as the reflections of the real Viper are replaced by the computer generated reflection maps. To avoid the appearance of a 2-D wipe or dissolve, the individual hexagons are wiped on in a random pattern.

MetroLight uses its own proprietary software for modeling, and Wavefront’s Preview and Side Effects’ Prisms for choreography. Prisms is also used for rotoscoping the Viper into the shot, placing wire-frame models over the live-action car, and positioning the 3-D model over the 2-D monitor image. Once the move has been plotted, the scene is passed to technical director Robert Beech, who applies reflection maps and lights the car. The shot is then composited digitally, output to Exabyte tape, converted to D1 tape and cut directly into the show.

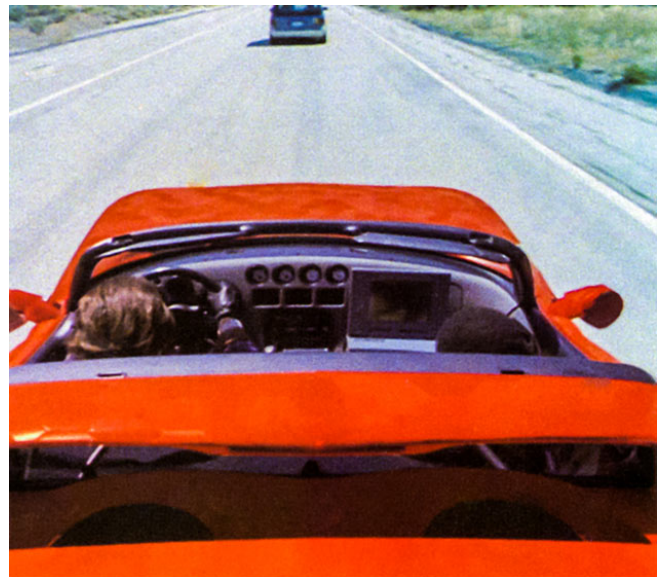
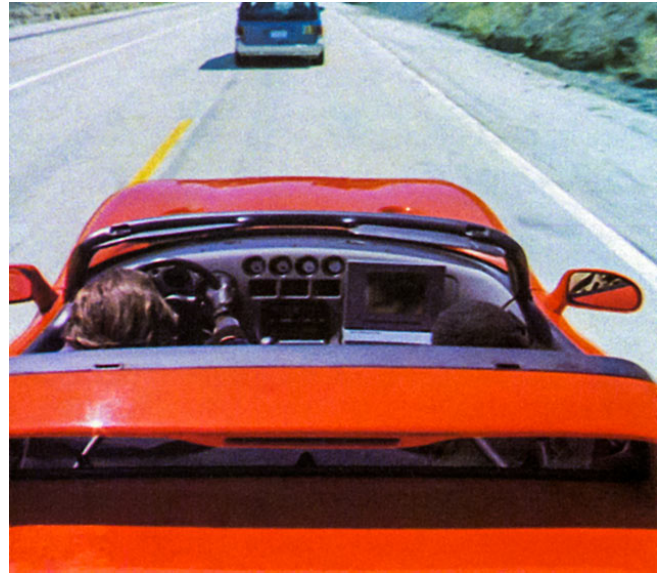
The critical registration work required for computer graphics meant that an accurate method for aligning the two cars had to be devised. It was discovered that both shared the same dashboard and that mounting screws could be used to match the positions of the vehicles for ‘parked’ transformations. Once the Viper is filmed, its doors are opened and two lasers are aligned on the mounting screws. The wheels are marked and the car is driven out. The Defender is then driven in, as close as possible to these marks, and a floor jack is used to move the car into a position where

the laser alignment points match precisely. After the Defender is photographed, a clean plate is shot – a plate that may be used later by Jennifer Law and Audri Phillips for paintbox cleanup work.

Extensive lighting diagrams and measurements enable MetroLight to recreate the live-action environment in the computer. Field calibration is done on the spot to reproduce the specifics of the lens employed. Still photographs are taken from the cars' perspective on all axes and used for the reflection maps on the car. "Even for the 'static' shots," Bailey commented, "we always put in some movement. We used both Image G's portable system and the ultimate Memory Head to do matched moves during a lot of our shots. MetroLight was able to take the data generated by the motion control units and read that in to create usable files for their roscope system."

Transforming the car as it drove offered more opportunities for creative problem solving. When physically attaching the camera to the cars proved impractical, a custom trailer was built to elevate the vehicles just inches off the ground. "The trailer is pushed or towed by a Shotmaker truck, and the camera is positioned so as not to reveal that the car is not in contact with the ground," Campbell explained. "By using visual cues, such as aligning the wheels of the Shotmaker with a certain line in the road and matching the driving speed, we get all of our passes. Reflection maps are photographed on a separate pass using two small Arris with 10mm wide-angle lenses." Because the bounce of a real car was missing in the footage of the specially mounted cars, MetroLight created a program to simulate road bounce in the final composite.

With Viper, MetroLight managed to set new standards for digital effects on the small screen. "The creators of the series were after a new look for the Viper transformation," commented MetroLight executive producer Dobbie Schiff. "In effect, what they required had never before been done. We were really excited to be involved in developing the technique."



Three-dimensional computer graphics were employed by MetroLight Studios to simulate the mechanical car transformations in Viper.

QUICK CUTS

A LADY IN DISGUISE

article by Christalene Loren

In the movies, divorce has been the focus of intense drama and absurd humor. Mrs. Doubtfire explores a little of both in an unusual spin on the subject when its main character, Daniel Hillard, a man in the midst of a painful separation, disguises himself as an elderly woman and applies for the job of housekeeper in his own home in order to stay close to his children.

Responsible for the transformation of actor Robin Williams into sweet old Mrs. Doubtfire were makeup artists Greg Cannom and Ve Neill, and hairstylist Yolanda Toussieng – all of whom shared an Academy Award this year for their work on the film. Their task was to create a makeup that would be subtle enough to satisfy an audience that had come to see Williams play the part of a woman, yet convincing enough to deceive both the character's wife and his shrewd children.

At the beginning of the project, the producers had expressed their desire to keep the makeup as simple as possible and limit the prosthetics to a false nose. "Ultimately," Cannom said, "that grew to include an elaborate prosthetic device. After reading the script, I was convinced that there was no way we were going to be able to put a nose on Robin Williams and hide him in the manner that was needed for the plot of the story. So I went back to the studio and developed some ideas to convince the producers that we had to go with a full-face makeup."

The full-face appliances required six weeks of design and production time. "We began by making a lifecast of Robin Williams' face and head with alginate. Hydracal plaster was poured into the fragile alginate mold, and from that we made a silicone mold that was used to produce another plaster head." The second head was then coated with Al-Cote, a water soluble plastic solution used for making dental impressions, that would facilitate the removal of clay sculpted over the plaster likeness. "Using oil-base clay, I created the sculpture that would eventually become the rubber appliances. One distinguishing feature of Robin Williams is his large jaw. Hiding that jaw was a major challenge. I had to cheat the clay by bringing the features slightly forward and rounding out the curves of his cheeks and chin so that the jaw would not look so pronounced."

Once the sculpture was approved, Cannom and his team at Cannom Creations began the involved process of creating molds for the eight latex rubber appliances. While still attached to the plaster, the clay sculpture was cut into eight sections and placed underwater to soak overnight. By the next morning, the Al-Cote had turned into a film which allowed the clay sculpture sections to be easily lifted from the plaster head.

For the appliances to interlock, each section of the clay sculpture was molded on top of a plaster cast of the previous section. "We went back to our silicone mold of Robin Williams and made a cast out of Ultracal – which is a more permanent plaster than Hydracal and can be baked in an oven without distorting. The first clay section, which was the nose and upper lip, was placed on the Ultracal head. More clay was added to blend out the sharp edges so they would lay flat against the face. Steve Prouty, our mold supervisor, and technician Todd Tucker made an epoxy mold of the Ultracal head with the first clay section attached. Ultracal was poured into the epoxy mold and a

head with an impression of the nose and upper lip appliance was created. On top of this second head we placed the clay section of the chin and the neck wraparound. The edges of the clay were blended over the edges of the plaster impression of the nose and upper lip section; and another epoxy mold of the head was made. This process was repeated for a mold of the lower lip, a mold of the forehead and a mold of the eyelids and eyebrows." When completed, the epoxy molds were injected with foam latex by foam technician Roland Blancaflor and baked in an oven at two hundred degrees for five hours to produce the rubber appliances.

Cannom Creations also created a number of single-piece masks that were used for scenes in which Robin Williams changed back and forth from Daniel Hillard to Mrs. Doubtfire. "In one sequence," said John Logan, production coordinator for Cannom Creations, "the disguise falls out of a window and is run over by a truck. We made a mold of the treads of a truck tire and used that impression on top of one of the rubber masks."

To give Robin Williams a generous feminine figure, a bodysuit was designed by Cannom and created by Linda Benevente-Notaro. The bodysuit consisted of breasts, buttocks, hips, thighs and stomach that were sculpted out of cotton, foam and plastic beads, then attached to a spandex bodysuit that extended from Williams' chin to his knees. Each element was attached separately to the spandex so that the padding would roll and move naturally as Williams moved.



Actor Robin Williams was transformed into the kindly housekeeper Mrs. Doubtfire via Academy Award-winning makeup and a full bodysuit designed and manufactured by Greg Cannom.

Hairstyle was another important element of the disguise. “Latex rubber restructures the whole shape of the head,” said Yolanda Toussieng, “so you need to find the right hairdo to balance the face. For example, the appliances gave Robin a pronounced jawline which we were trying to hide. Adding curls along the side of his face so that he had more width behind his ears helped to hide his jaw. The wig was glued to the rubber skullcap with water-base spirit gum; and each day the wig was styled, in place, on Robin’s head.”

Ve Neill was in charge of applying the makeup during production. “The edges of the appliances blended over each other and had to fit perfectly in order to completely cover Robin Williams’ face,” Neill commented. “The application was like building a jigsaw puzzle. I used a medical adhesive to attach the appliances to Robin’s skin. The whole application process, including the wig, took about three hours. The appliances could only be used once – they were destroyed when we removed them each day. We had to use over forty copies of each appliance during the production.”

To mask the transition between latex rubber and skin, the appliances were coated in place with Pax paint, a product developed by renowned makeup pioneer Dick Smith. “Latex has a dense white color,” Neill explained, “and the Pax paint is used to create a base for the flesh tones and to even out the coloring in areas where the skin is exposed. The only exposed areas on Robin Williams were his ears and eyelids; so I had to completely fabricate the skin color for Mrs. Doubtfire. Skin color is composed of a number of individual tones and layers of pigmentation. My assistant, Stephan Dupuis, and I applied the first layer of Pax paint using the torn edge of a white makeup sponge. We used a dark rosy color and I stippled a flesh tone on top of the rose. Then we went back with the rose color and a peach color on top of the flesh tone. On top of the Pax paint we applied more flesh tones using rubber mask grease makeup with the same sponging technique. Originally, we intended to create the look of older skin by applying age spots and brown and maroon colorations; but we found that the heavy mottling did not make the character look very attractive, so I began toning that down.”

After the basic skin coloration was completed, Ve Neill added the street makeup that an elderly woman might apply to her face. “I used a small amount of beige and rouge to define the eyes. I also



Attended to the daily three-hour application – and sharing in the Oscar honors – were makeup artist Ve Neill and hairstylist Yolanda Toussieng.

added a touch of mascara and taupe eye shadow and finished with pearlized peach lipstick. The makeup gave her a very rosy, peaches-and-cream complexion, like someone who came from the British Isles.”

Though skillfully designed, manufactured and applied, the success of the makeup depended largely upon Robin Williams’ acting skills. “There is an art to acting while wearing latex appliances,” Neill concluded. “The actor has to remember to over-animate the facial gestures in order to translate through the rubber makeup all of the subtle movements that are expressed in normal skin. With Robin Williams, his body language and incredibly animated facial features, plus his unlimited talent for humor and the absurd really brought the character of Mrs. Doubtfire to life.”

COMMERCIAL SPOT KONG REENERGIZED

article by Paul Mandell

When simian juggernaut *King Kong* plucked tenants from their bedrooms faster than a seasoned Manhattan slumlord, and turned the Big Apple into a shambles in 1933, it's a sure bet that chasing a rabbit across a rooftop was not on the mighty ape's agenda. Nevertheless, the folks at the Chiat/Day advertising firm turned cinema history on its ear by having Kong do just that for a startling Energizer battery commercial.

The eye-grabbing spot harnessed talent on two continents. Director Danny Klineman, producer David Botterell and cinematographer Curtis Clark – who work out of Limelight Productions in London – carried out their respective tasks. Jim Henson's Creature Shop – also in London – handled the animatronics. And the 525 facility in Los Angeles accomplished the digital postproduction.

Done as a two-parter, the ad begins with the mogul of a rival battery company instructing a simple-minded Kong (via a picture-association card) to hunt down and decimate the drum-beating Energizer rabbit. Scaling the Empire State Building, Kong sees a blonde and her companion through a window, but passes her up after rechecking his instructions. Kong gets a toehold on her window sill, peers over the edge of the roof and eyeballs the rabbit skimming past, practically under his nose. At just that moment, the annoyed blonde slams the window on the ape's foot, sending him plummeting to the pavement as the invincible hare continues on its merry way.

Imperative in the live-action shoot, and key to the entire spot, was re-creating of the look and feel of the vintage *King Kong* – right down to the grain characteristic of the film – since footage from it would, in some instances, be intercut directly with new footage and, in others, blended digitally. To ensure visual continuity, Danny Klineman prevailed on cameraman Curtis Clark to re-create *King Kong*'s photographic élan. Clark achieved this, in part, by employing a set of vintage lenses that helped provide a successful devolution to thirties-style resolution. Also, since footage of the blonde and the new Kong had to be shot in color for blue-screen work – with all color ultimately removed in post to match the original film – Eastman 5294 was chosen because it is inherently grainier than the newer generation of T-grain stocks. For an even grainier look, the film was force-processed chemically since electronically-induced grain would not have delivered the desired effect. “We wanted to push it as far as possible to simulate aging,” said David Botterell, “but we couldn't compromise the matte work to get that grainy period look. It would have been difficult to extract clean mattes if the film had been pushed to its limit. We walked a tightrope to make it work visually.”

Another imperative was creating a Kong image that was structurally and kinetically compatible with the Willis O'Brien/Marcel Delgado original. Attempts to replicate this pseudo-ape down through the years had always been vexing. The best of the lot was built and stop-framed by David Allen for a Volkswagen commercial in 1973. For the Energizer spot, Danny Klineman visited London's Museum of the Moving Image on the notion that a vintage Kong was on display there, but discovered it to be a corroded *Mighty Joe Young* miniature.

With no figure to copy, Klineman had to rely on stills supplied by the British Film Institute, at which point he began to re-evaluate *King Kong*'s methodology. "The ad agency's plan had been to do it as a stop-frame puppet," Botterell revealed, "but that would have taken forever. Danny decided that stop-frame was not practical; so he had the Creature Shop in London build a human-size animatronic Kong for real-time performance. He had the theory that we could simulate the look of stop-frame by filming at different speeds and then dropping frames. The primary motion would be in real time, but there would be enough information missing to make it match to the idiosyncratic jerkiness of the original."

The new Kong was sculpted by Colin Shulver and built by Simon Donaldson under the supervision of Creature Shop supervisor Verner Gresty. The animatronic headpiece worn by body performer Michelan Sisti contained a mechanism governed by a computer, which allowed chief puppeteer Bruce Lanoil and keyboard technicians Quentin Plant and Hal Bertram to actuate facial expressions and brow movements via remote control. Completing the outfit was a fur-covered arm and a torso skin that went down to the waist. A mechanical leg was also constructed for the hotel window scene.

"The concern was getting this authentic look," Gresty explained. "Usually we use the Henson Performance Control System, whereby a single puppeteer controls all the facial movements and lip sync – sort of a sophisticated Waldo. But for the Energizer spot we used a new thing here, our Edit Suite, which plugs into the Henson System. It allows us to capture a performance in real time, that can be played back at any speed within the limits of the servo motor." The Edit Suite creates a data stream that flows from the puppeteer's controls to the animatronic head. That stream can be intercepted and digitally edited and recorded on a hard drive for playback. The puppet performs in terms of whatever editing of the data stream has occurred. In this case, Michelan Sisti performed the gross arm and head movements, while the facial expressions were a playback of the final digital edit.

To simulate the stop-motion look, several formulas were tried. The one finally decided upon was an animatronic playback at quarter speed with Sisti also performing at quarter speed. Filming was at thirty frames per second, with every eighth frame doubled and the rest dropped. The team provided a further dose of verisimilitude by training air hoses on the animatronic head to simulate the classic puppet's 'fur dance' – an unintentional bristling resulting from impressions made by the animators' fingers during frame-by-frame manipulation. (Ironically, O'Brien's miniature ape had been covered by rabbit pelts.)

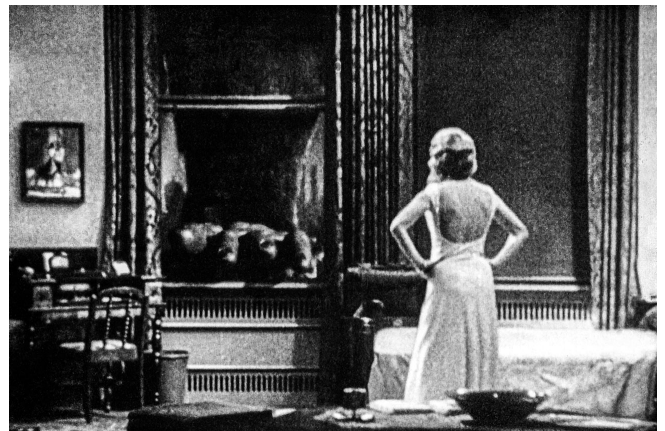
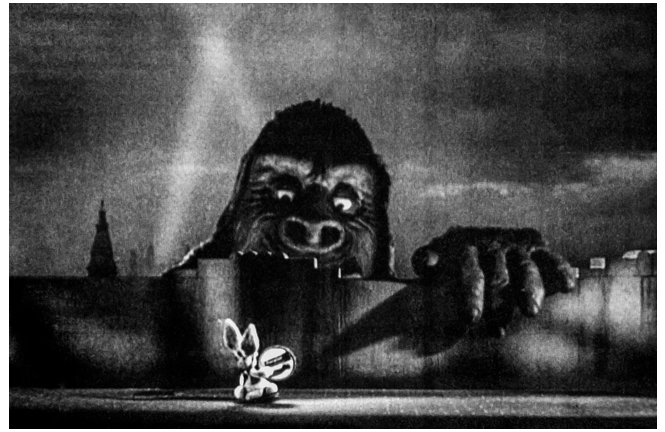
When tests were completed, Kong was shipped to the Creature Shop in Los Angeles, where final detailing was accomplished under the supervision of David Barrington Holt. The six-day shoot took place at the bluescreen facilities of Hollywood Center Stage.

Scenes from *King Kong* were transferred from film to tape at Post Logic. For the cleanest transfer possible, the 1989 restored version of Kong was made available by Turner Entertainment. The new bluescreen footage was transferred to tape in color so that all the compositing could be done digitally at 525's visual effects facility. There, Quantel Henry artist Tim Webber spent eight days jigsawing picture information from Kong with bluescreen shots of the actress and the new ape.

The first scene of animatronic Kong at the window used actual frames of Fay Wray and Bruce Cabot seated on the bed. Getting the scene of the comedic window slam was far more challenging, since it required a frame of the empty bedroom which, to Klineman's dismay, did not exist in the movie. However, specific areas of the room were empty at various points in the sequence, so Tim Webber was summoned to create a vacant boudoir by assembling sections from different frames on the Henry. Ultimately the window slam scene used four separate elements: the interior wall from the original movie, a new closeable window with Fay Wray's body double filmed bluescreen, a bluescreen element of the mechanical foot, and a cityscape extracted from the vintage film.

The moment in which Kong spots the Energizer bunny from the rooftop ledge combined elements of the mechanical rabbit filmed on a large set, Kong's animatronic head and a scale model set against bluescreen, and a background of vintage skyline. The alignment and mixing of shadows were worked out on the Henry. In addition, because the skyline plate contained projection scratches, similar aberrations were digitally introduced over the foreground to maintain visual integrity.

If arch *King Kong* producer Merian C. Cooper were alive today, one might conjure up a stormy vision of him throwing his hat to the ground and his pipe against the wall after seeing the latest incarnation of his sacred ape. But then again, he might have shared a chuckle with David Botterell, who saw this experience as a successful new spin on a monstrously popular icon. "It was a genuine challenge, using new techniques to match sixty-year-old stop-frame footage," Botterell reflected. "Kong's facial expressions in the first scene when he looks through the window – that articulation that doesn't go beyond the limitations of stop-frame – that's what really sells the idea. Once you see those exaggerated eyebrow movements and then the bunny, you know something very strange is happening on your television screen."



For an Energizer battery commercial made by Limelight Productions, classic footage from King Kong was deftly intercut or digitally merged with new footage – painstakingly matched to the original – featuring an animatronic ape suit built by Jim Henson's Creature Shop.

PROFILE

KEVIN YAGHER

article by Marc Derro

Working seven days a week for nearly a decade might seem like a nightmare to some, But for makeup effects artist and director Kevin Yagher, it is simply a manifestation of a lifelong passion. Yagher, who heads his own effects studio, Kevin Yagher Productions, is perhaps best known for his work on the *nightmare on Elm Street* movies and HBO's *Tales from the Crypt*.

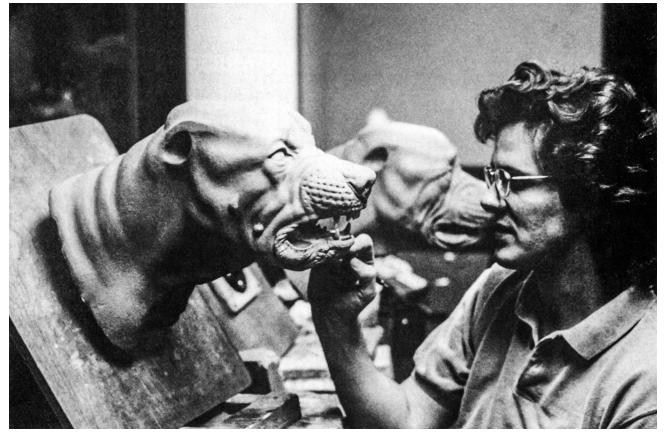
Born in Illinois and raised in Dayton, Ohio, Yagher traces his passion to an early fascination with movie monsters. "My older brother Jeff and I couldn't have been more than four or five years old when we started collecting models," Yagher recalled. "He got the Mummy and I got *Frankenstein*. On birthdays, when we were allowed to stay up late, we'd sit transfixed in front of the TV until two in the morning watching horror films."

As the brothers grew older, they continued to share a mutual interest in monsters and other fantasy characters. "We used to make our own 8mm werewolf movies. In high school, I would be the kid who did the *Planet of the Apes* book report and dressed up like a character from the book. I remember one time I came in made up as a half-goat/half-man Pan kind of thing from mythology."

Participation in high school drama fueled Yagher's interest in makeup and led to some early attempts at mask-making for a children's theater production of *Alice in Wonderland*. After graduation, he enrolled in the fine arts degree program at Ohio State University; however, a brief, one-year stint proved disappointing. "I was unhappy with the program. I wanted to study makeup; but the best they could offer was a specialization in production design or wardrobe design, and I didn't care to pursue that."

Returning to Dayton, Yagher enrolled in community college courses and launched his own *Halloween* mask business. He quickly sold a line of his latex designs to a local distributor with stores throughout the Midwest, and began producing masks at home. "They were the typical pullover, neck-split type masks – gorillas, corpses, car accident victims – whatever would sell during *Halloween*," said Yagher. "I remember setting up a sort of makeshift warmer in my garage because the latex would take so long to cure and I had so many masks to deliver. I had to speed up the process, so I put together some kind of heating element in a wooden box and put the masks in there to keep them warmer than the cold air."

During two seasons in the mask business, Yagher began a correspondence with veteran makeup artist Dick Smith that led ultimately to his relocation from Dayton to California in 1983. “Dick was very helpful – really pushed me and encouraged me,” recalled Yagher, who was only twenty years old at the time. “We exchanged letters and phone calls, and he kept saying, ‘You really need to go to New York or L.A.’ Then he gave me a bunch of names of people in the industry; and one of them was Greg Cannom.” Upon relocating to Los Angeles, Yagher went to see Cannom, and four weeks later was offered his first assignment, working on *Dreamscape* and *The Last Starfighter*. “I couldn’t have been earning more than minimum wage at the time, but for me it was unbelievable – to be getting paid for doing something that was once a hobby.”



Makeup artist Kevin Yagher sculpts a mastiff that will serve as the basis for a number of animatronic canines in *Man’s Best Friend*.

Under Cannom’s tutelage, Yagher worked on several other projects in whirlwind succession, including the Michael Jackson Thriller video and *Friday the 13th – Part IV*. “Cocoon was my final show with Greg,” noted Yagher. “It was a good experience because it was a big show and I got to supervise a lot of the work.” During that project, Yagher developed a friendship with fellow makeup effects artist Alec Gillis. Following the film’s completion, the two spent six months working together experimenting with monsters and old-age makeup. When Gillis was subsequently hired at Stan Winston Studio, Yagher signed on soon after. Six weeks into the job, however, he received a call from the producers of *A Nightmare on Elm Street 2* offering him a shot at his first solo project. Accepting the offer, and with only two years of experience under his belt, Yagher launched his own company, Kevin Yagher Productions. Still active today, the small company went on to complete two more *Nightmare* sequels, as well as makeup effects for a host of other films, including *The Hidden*, the *Child’s Play* trilogy, *The Seventh Sign*, *Bill and Ted’s Excellent Adventure*, *Glory*, *Radio Flyer* and *Honey, I Blew Up the Kid*.

Shortly after his work on *Child’s Play*, Yagher was approached by producer Joel Silver to design and build an animatronic puppet – the Crypt Keeper – for an anthology series he was producing for HBO called *Tales From the Crypt*. The assignment became a springboard for Yagher’s growing interest in directing. “At the start of the project,” Yagher recalled, “I met with Richard Donner, who was supposed to direct the first six Crypt Keeper wraparound sequences for the show. I showed him some storyboards I had drawn illustrating how I thought the puppet could be shot. He liked them and decided I’d be just fine on my own; so he said, ‘Good



luck,' patted me on the back and took off. The line producer got a little panicked; but by the end of the first day, I was directing the wraparound." It was an assignment Yagher eventually would carry all the way through, from conceptual sketches to creation of the puppet to writing some of the dialogue for the first few seasons to directing the sequences for all sixty-five shows to date.

Yagher poses for a portrait with some of his more memorable creations.

Positive response to the Crypt Keeper segments encouraged Yagher to pursue more challenging assignments. "One day, I approached Joel Silver about the possibility of directing a full episode. He looked at me and said: 'You'll do one. Maybe next season.'" Unable to obtain a firm commitment, Yagher made the producer an offer he couldn't refuse – negotiating a reduced fee on his contract in return for a shot at directing an episode. The result, *Lower Berth* – a story about the Crypt Keeper's parents – went on to receive CableACE Award nominations for directing, makeup, screenplay and photography. The show also featured Yagher's older brother Jeff – now a professional actor – in the role of the Crypt Keeper's father, a two-faced man in a carnival sideshow. "Here we are, twenty years later, doing the same thing we were doing as kids – only he ended up playing the monsters and I ended up making them."

Pleased with the success of *Lower Berth*, the producers offered their novice director a second shot. "I didn't even have to take anything off my contract to do it," said Yagher of his subsequent episode entitled *Strung Along*, starring Donald O'Connor as an old-time puppeteer.

Returning full time to his effects work, Yagher last year completed a project for New Line Cinema's canine horror film, *Man's Best Friend*. Tasked with creating a dog that gradually reverts to a primal state in a bio-engineering experiment gone awry, Yagher built fifteen animatronic dog heads and other parts for the film, modeling the puppet work very specifically on a huge mastiff.

More recently, Yagher has done makeups for projects such as *Getting Even with Dad*, a feature starring Ted Danson and Macaulay Culkin. "We did a couple of G-force makeups on Ted Danson, Macaulay Culkin and a couple of other actors for when they get on a theme park ride. To create this G-force look, they wore appliances on copies of their teeth that stood out about an inch in front of their real mouths." Yagher has also kept busy in recent months creating the makeup effects for a low-budget project entitled *Rumplestiltskin*. More exciting for Yagher, however, has been his recent selection to direct *Hellraiser 4*, his first full-length feature.

Currently at work on a script for Paramount that he would like to direct some time in the future, Yagher still keeps abreast of advances in the effects side of the business. "I haven't quite made the leap to digital because I don't want to invest a great deal of money just to find the technology obsolete in a year. I'm waiting for the dust to settle first." In the meantime, Yagher hopes to steer his namesake company on an independent course. "I'll always have my effects business – no matter what happens with my directing career – but I'd really like to be creating in-house creatures, working with computer animation and live-action puppeteering characters, and producing projects on my own out of this facility."



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